SEMESTER –I

SEMESTER –I
Mathematics Foundation to Computer Science - I

CC101	25BCA401DS01	Mathematics Foundation to Computer Science - I	3L:0T:0P	3 Credits

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer questions covering the entire syllabus. Students must attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory. All questions will carry equal marks.

Course Objectives

CO1: Provide a basic understanding of fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics.

CO2: This course enables the students to use mathematical models and techniques to analyze and understand problems in computer science.

CO3: This course demonstrates how mathematical principles give a succinct abstraction of computer science problems and help them to analyze them efficiently.

Course Content:

UNIT I: **Set, Relation and Function:**

Set, Set Operations, Properties of Set operations, Subset, Venn Diagrams, Cartesian Products.
Relations on a Set, Properties of Relations, Representing Relations using matrices and digraphs, Types of Relations, Equivalence Relation, Equivalence relation and partition on set, Closures of Relations, Warshall's algorithm.
Functions, properties of functions (domain, range), composition of functions, surjective (onto), injective (one-to-one) and bijective functions, inverse of functions.
Some useful functions for Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.

UNIT II:**Counting and Recurrence Relation:**

Basics of counting, Pigeonhole principle, permutation, combination, Binomial coefficients, Binomial theorem.
Recurrence relations, modelling recurrence relations with examples, like Fibonacci numbers, the tower of Hanoi problem. Solving linear recurrence relation with constant coefficients using characteristic equation roots method.

UNIT III:**Elementary Graph Theory:**

Basic terminologies of graphs, connected and disconnected graphs, subgraph, paths and cycles, complete graphs, digraphs, weighted graphs, Euler and Hamiltonian graphs.
Trees, properties of trees, concept of spanning tree. Planar graphs. Definitions and basic results on the topics mentioned.

UNIT IV:**Matrix Algebra:**

Types of matrices, algebra of matrices–addition, subtraction, and multiplication of matrices, determinant of a matrix, symmetric and skew-symmetric matrices, orthogonal matrix, rank of a matrix, inverse of a matrix, applications of matrices to solve system of linear equations, Eigen values and Eigen vectors, Caley-Hamilton theorem.

Text Books

1. Garg, Reena, Engineering Mathematics, Khanna Book Publishing Company, 2024. (AICTE Recommended Textbook)
2. Garg, Reena, Advanced Engineering Mathematics, Khanna Book Publishing Company,2023.
3. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.
4. Deo Narsingh, Graph Theory with Application to Engineering and Computer Science, Prentice Hall, India, 1979.
5. Vasishtha A. R. and Vasishtha A. K., Matrices, Krishna Prakashan, 2022.

Reference Books

1. Grimaldi Ralph P. and Ramana B. V., Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Education, 2007.
2. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
3. West Douglas B., Introduction to Graph Theory, Second Edition, Pearson Education, 2015

Web Resources

1. https://nptel.ac.in/courses/106103205
2. https://nptel.ac.in/courses/111101115

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Problem Solving Techniques

SEC101	25BCA401SEC01	Problem Solving Techniques	3L:0T:4P	5 Credits

Course Objectives

CO1: Understand basic terminology of computers, problem solving, programming Languages and their evolution (Understand)

CO2: Create specification from problem requirements by asking questions to disambiguate the requirement statement. (Create)

CO3: Design the solution from specification of a problem and write pseudo code of the algorithm using basic building blocks or structured programming constructs (Sequence, Selection and Repetition statement). (Create)

CO4: Translate an algorithm into a C computer program (Create)

CO5: Testing and analysing programs using debugging tools. (Analyze)

Prerequisite: This is an introductory programming course and hence no prerequisites

Course Content:
UNIT I: (CO-1, CO-2)
Problems And Problem Instances, Generalization and Special Cases, Types of Computational Problems, Classification of Problems, Analysis of Problems, Solution Approaches, Algorithm

Development, Analysis of Algorithm, Efficiency, Correctness, Role of Data Structures in Problem Solving, Problem-Solving Steps (Understand the Problem, Plan, Execute, And Review), Breaking the Problem into Subproblems, Input/Output Specification, Input Validation, Pre and Post Conditions.

UNIT II: (CO-2, CO-3, CO-4)

Structured Programming Concepts: Sequence (Input/Output/Assignment), Selection (If, If-Else) And Repetition (For, While, Do-While) Statements, Control Structure Stacking and Nesting. Different Kinds of Repetitions: Entry Controlled, Exit Controlled, Counter Controlled, Definite, Indefinite and Sentinel-Controlled Repetitions. Pseudocode and Flowcharts. Definition And Characteristics of Algorithms, Standard Algorithm Format. Problems Involving Iteration and Nesting: Displaying Different Patterns and Shapes Using Symbols and Numbers, Generating Arithmetic and Geometric Progression, Fibonacci and Other Sequences, Approximate Values For π, $\sin(x)$, $\cos(x)$, Etc. Using Taylor Series. Different Kinds of Data in The Real World and How They are Represented in The Computer Memory. Representation of Integers: Signed Magnitude Form, 1's Complement And 2's Complement. Representation of Real Numbers: IEEE 754 Floating Point Representation. Representation of Characters: ASCII, UNICODE.
C Language: Introduction To Programming Languages, Different Generations of Programming Languages. Typed Vs Typeless Programming Languages, History of C Language, An Empty C Program. C Language Counterparts For Input (scanf()), Output (printf()) Statements, Assignment, Arithmetic, Relational and Logical Operators. If, If-Else Statements, For, While, Do-While Statements. Data Types. Translating Pseudocode/Algorithm to C Program. Incremental Compilation and Testing of The C Program. Simple Problems Involving Input, Output, Assignment Statement, Selection and Repetition. Good Coding Practices.

UNIT III: (CO-2, CO-3, CO-4)

Problems on Numbers: Extracting Digits of a Number (Left to Right and Right to Left), Palindrome, Prime Number, Prime Factors, Amicable Number, Perfect Number, Armstrong Number, Factorial, Converting Number from One Base to Another. Statistics (Maximum, Minimum, Sum and Average) on a Sequence of Numbers which are Read using Sentinel Controlled Repetition using only a few Variables.
C Language: else-if Ladder, switch Case, Increment/Decrement Operators, break and continue Statements.

UNIT IV: (CO-2, CO-3, CO-4, CO-5)

Modular Programming, Top-Down and Bottom-Up Approaches to Problem Solving. Recursion. Problems on Arrays: Reading and Writing of Array Elements, Maximum, Minimum, Sum, Average, Median and Mode. Sequential And Binary Search. Any one Sorting Algorithm. Matrix Operations.
C Language: Function Definition and Declaration (Prototype), Role of Return Statement, One Dimensional and Two-Dimensional Arrays. String Functions. Other Operators, Operator Precedence and Associativity. Debugging.

Text Books
1. Venkatesh, Nagaraju Y, Practical C Programming for Problem Solving, Khanna Book Publishing Company, 2024.

2. AICTE's Programming for Problem Solving (with Lab Manual), Khanna Book Publishing Company, 2024.
3. Harvey Deitel and Paul Deitel, C How to Program, 9th edition, Pearson India, 2015.
4. R G Dromey, How to Solve It by Computer.

Reference Books

1. Brian W. Kernighan and Dennis Ritchie, The C Programming Language, 2nd edition, Pearson, 2015.
2. Jeri Hanly and Elliot Koffman, Problem Solving and Program Design in C, 8th edition, Pearson, 2015.

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Problem Solving Techniques: Lab Problems

UNIT-II

1. Converting degrees Celsius to Fahrenheit and vice versa?
2. Display three input numbers in sorted (non-decreasing) order?
3. Given a positive integer value n (>= 0) display number, square and cube of numbers from 1 to n in a tabular format?
4. Given an input positive integer number, display odd numbers from in the range [1,n]?
5. Display first mathematical tables, each table up to 10 rows? Generalise this to display first n (> 0) mathematical tables up to m (m > 0) rows?
6. Display following patterns of n rows (n > 0), For the below examples n = 5? For each pattern write a separate algorithm/program?

$	$	12345	12345
$$	$$	1234	1234
$$$	$$$	123	123
$$$$	$$$$	12	12
$$$$$	$$$$$	1	1

7. Display the following patterns of n rows (n > 0), for the below examples n = 5?

Hollow square pattern:	Triangle Patterns with numbers:	Square with diagonals:	Diamond Pattern
##### # # # # # # #####	1 121 12321 1234321 123454321	(diagonal star pattern)	* *** ***** *** *

		* * * *	

8. Given the first term (a), difference/multiplier (d) and number of terms (n > 0), display the first n terms of the arithmetic/geometric progression?
9. Display the first n (n > 0) terms of the fibonacci sequence?
10. Display the first n (n > 0) terms of the Tribonacci sequence?
11. Given two positive integer numbers n1 and n2 check if the numbers are consecutive numbers of the fibonacci sequence?
12. Compute approximate value of π considering first n (n > 0) terms of the Taylor series for π?
13. Compute approximate value of e^x considering first n (n > 0) terms of the Taylor series for e^x?
14. Compute approximate value of sin(x)/cos(x) considering first n (n > 0) terms of the Taylor series for sin(x)/cos(x)?

UNIT-III

1. Extract digits of an integer number (left to right and right to left)?
2. Given a sequence of digits form the number composed of the digits. Use sentinel controlled repetition to read the digits followed by -1. For example, for the input 2 7 3 2 9 -1 the output number is 27329?
3. Check if a given positive integer number is a palindrome or not?
4. Compute character grade from the marks (0 ≤ marks ≤ 100) of a subject. Grading Scheme: 80-100 : A, 60 - 79: B, 50 - 59: C, 40-49: D, 0-39: F? Solve this using both else-if ladder and switch case?
5. Compute the sum of a sequence of numbers entered using sentinel controlled repetition?
6. Check if a given positive integer number is a prime number or not?
7. Compute prime factors of a positive integer number?
8. Check if two positive integer numbers are amicable numbers or not?
9. Check if a given positive integer number is a perfect number or not?
10. Check if a given positive integer number Armstrong number or not?
11. Converting a positive integer number (n > 0) from one base (inputBase) to another base (outputBase) (2 <= input Base, outputBase <= 10). Input number should be validated before converting to make sure the number uses only digits allowed in the input base?

12. Write a program to display a number in text form. For example If the number is 5432 the output should be "FIVE FOUR THREE TWO"?

13. Using the grading scheme described in the question 4 (UNIT III), Compute how many students awarded each grade and display the frequency as a bar chart (horizontal) using single "*" for each student. Use sentinel controlled repetition (-1 as sentinel value) in reading the students marks. Use else-if ladder/switch case to compute the grade and the corresponding frequency.

Sample bar chart when the class has 7-A, 10-B, 3-C, 7-D and 1-F grades.

A:
****
B:
****
 C: ***
D:
****
F: *

14. Compute maximum, minimum, sum and average of a sequence of numbers which are read using sentinel controlled repetition using only few variables?

15. Compute body mass index, BMI = weightinKGs / (HeightinMeters *HeightinMeters), Both weight and height values are positive real numbers. Your program should display BMI value followed by whether the person is Underweight, Normal, Overweight or Obese using the below ranges:
BMI Values
Underweight: less than 18.5
Normal: >=18.5 and <25
Overweight: >=25 and < 30
Obese: >= 30

UNIT IV

1. Design a modularized algorithm/program to check if a given positive integer number is a circular prime or not?
2. Design a modularized algorithm/program to compute a maximum of 8 numbers?
3. Design a modular algorithm/program which reads an array of n integer elements and outputs mean (average), range (max-min) and mode (most frequent elements)?
4. Design a modular algorithm/program which reads an array of n integer elements and outputs median?
5. Implement your own string length and string reversal functions?
6. Design algorithm/program to perform matrix operations addition, subtraction and transpose?
7. Write a recursive program to count the number of digits of a positive integer number?
8. Recursive solutions for the following problems:
    a. Factorial of a number?
    b. Display digits of a number from left to right (and right to left)?
    c. Compute x^y using only multiplication?

d. To print a sequence of numbers entered using sentinel controlled repetition in reverse order?

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Computer Architecture

CC102	25BCA401DS02	Computer Architecture	3L:0T:4P	5 Credits
Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer questions covering the entire syllabus. Students must attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory. All questions will carry equal marks.				

Course Objectives

CO1: To Understand the basics of Digital Electronics and Binary Number System
CO2: To Learn the implementation of Combinational Circuit.
CO3: To Learn the implementation of Sequential Circuit.
CO4: To Understand the Organization of basic computers.
CO5: To Understand the concept of Parallel Processing.
CO6: To understand the concept of memory organization.

Course Content:

UNIT-I
Digital Principles: Definition for Digital signals, Digital logic, Digital computers, Von Neumann Architecture, Boolean Laws and Theorems, K-Map: Truth Tables to K-Map, 2, 3 and 4 variable K Map, K-Map Simplifications, Don't Care Conditions, SOP and POS.
Number Systems: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic, Addition and subtraction of BCD, Octal Arithmetic, Hexadecimal Arithmetic, Binary Codes, Decimal Codes, Error detecting and correcting codes, ASCII, EBCDIC, Excess3 Code, The Gray Code.

UNIT-II
Combinational Circuits: Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, Demultiplexer
Sequential Circuits: Flip-Flops- SR Flip- Flop, D Flip-Flop, J-K Flip-Flop, T Flip-Flop.
Register: 4 bit register with parallel load, Shift Registers- Bidirectional shift register with parallel load Binary Counters-4 bit synchronous and Asynchronous binary counter.

UNIT-III
Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, InputOutput Interrupt, Complete Computer Description, Design of Basic Computer, Design of

Accumulator logic. Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC), RISC Vs CISC.

UNIT-IV

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input-Output Processor(IOP).

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Text Books:
1. Donald P Leach, Albert Paul Malvino, Goutam Saha- "Digital Principles & Applications" , Tata McGraw Hill Education Private Limited,2011Edition.
2. M. Morris Mano- "Computer System Architecture", Pearson/Phi, Third Edition.

Reference Books:
1 William Stallings- "Computer Organization and Architecture", Pearson/PHI, Sixth Edition,
2 Andrew S. Tanenbaum- "Structured Computer Organization", PHI /Pearson 4th Edition,
3 M.V .Subramanyam, "Switching Theory and Logic Design", Laxmi Publications (P) Ltd.
4 Ikvinderpal Singh, Computer Organization Architecture, Khanna Book Publishing.

Suggestive Laboratory Experiments:

1. Verify logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates.
2. To study and verify NAND as a Universal Gate
3. To verify De- Morgan's theorem for 2 variables
4. Design and test of an S-R flip-flop using NAND/NOR gate.
5. Convert BCD to Excess-3 code using NAND gate
6. To Convert Binary to Grey Code
7. Verification of Truth Tables of J-K Flip-Flop using NAND/NOR gate
8. Realize Decoder and Encoder circuit using Basic Gates.
9. Design and implement the 4:1 MUX using gates.
10. Implementation of 4-Bit Parallel Adder Using 7483 IC.
11. Design and verify operation of half adder and full adder.
12. Design and verify operation of half subtractor.
13. Design and Implement a 4 bit shift register using Flip flops.
14. Implement Boolean function using logic gates in both SOP and POS
15. Design and Implement a 4 bit synchronous counter.
16. Design and verify 4 bit asynchronous counter.

Hardware

1. Familiarize the computer system layout: marking positions of SMPS, motherboard, FDD, HDD, CD, DVD and add on cards.
2. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/ 64 bit)
3. Identify and Troubleshoot the problems of RAM, SMPS and motherboard
4. Configure BIOS settings- disable and enable USB and LAN 5. Adding additional RAM to the system.(expanding RAM size).
6. To Study mother board layout of a system.
7. Demonstrate the assembly of a PC
8. Demonstration of various ports: CPU, VGA port, PS/2 (keyboard, mouse) ,USB, LAN, Speaker, Audio.
9. Install and configure windows OS
10. To study the installation of Printer and trouble shooting.

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General English – I

AEC 101	25ENGX01AE01	General English - I	1L:1T:0P	2 Credits

Course Objective:

1. To provide learning environment to practice listening, speaking, reading and writing skills.
2. To assist the students to carry on the tasks and activities through guided instructions and materials.
3. To effectively integrate English language learning with employability skills and training.
4. To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

Course Content:

Unit- I: Vocabulary Building and Basic Writing Skills

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

Unit- II: Identifying Common Errors in Writing

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies

Unit- III: Nature and Style of sensible Writing

Describing, Defining, Classifying, providing examples or evidence, writing introduction and conclusion, Module V: Writing Practices, Comprehension, Précis Writing, Essay Writing.

Unit-IV: Oral Communication (This Module involves interactive practice sessions in Language Lab)

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations.

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations.

Text/Reference Books:

1. AICTE's Prescribed Textbook: Communication Skills in English (with Lab Manual), Anjana Tiwari, Khanna Book Publishing Co., 2023.
2. Effective Communication Skills. Kul Bhushan Kumar, Khanna Book Publishing, 2022.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. Remedial English Grammar. F.T. Wood. Macmillan.2007
5. On Writing Well. William Zinsser. Harper Resource Book. 2001
6. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
7. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011. 8. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

Alternative NPTEL/SWAYAM Course:

S.No.	NPTEL/SWAYAM Course Name	Instructor	Host Institute
1	English language for competitive exams	Prof. Aysha iqbal	IIT MADRAS
2	Technical English for engineers	Prof. Aysha iqbal	IITM

Course Outcomes: The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills

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Indian Knowledge System

MDE 101	25SOCX01MD01	Indian Knowledge System	2L:0T:0P	2 Credits

*For Detailed Course Refer APPENDIX – II

Environmental Science and Sustainability

VAC 101	25CSAX01VA01	Environmental Science and Sustainability	2L:0T:0P	2 Credits

Course description:
This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. The course content is divided into four comprehensive units. Unit 1 introduces basic environmental principles, the man-environment relationship, and sustainability issues.

Unit 2 focuses on ecosystems, biodiversity, and sustainable practices.

Unit 3 addresses environmental pollution, waste management, and sustainable development strategies. Finally,

Unit 4 explores social issues, environmental legislation, and practical applications through hands-on fieldwork. Through this holistic approach, students will gain a deep understanding of environmental processes, the importance of sustainable practices, and their role in promoting sustainability within business contexts.

Course Objective(s):
1. This course aims to familiarize students with basic environmental concepts, their relevance to business operations, and forthcoming sustainability challenges.
2. This course will equip students to make decisions that consider environmental consequences.
3. This course will enable future business graduates to become environmentally sensitive and responsible managers.

Course Content:

Unit 1: Understanding Environment, Natural Resources, and Sustainability
Fundamental environmental concepts and their relevance to business operations; Components and segments of the environment, the man-environment relationship, and historical environmental movements. Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation. Sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. The conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education.

Unit 2: Ecosystems, Biodiversity, and Sustainable Practices
Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the threats it faces, and the methods used for its

conservation. Ecosystem resilience, homeostasis, and carrying capacity, emphasizing the need for sustainable ecosystem management. Strategies for in situ and ex situ conservation, nature reserves, and the significance of India as a mega diverse nation.

Unit 3: Environmental Pollution, Waste Management, and Sustainable Development
Various types of environmental pollution, including air, water, noise, soil, and marine pollution, and their impacts on businesses and communities. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management; Natural and man-made disasters, their management, and the role of businesses in mitigating disaster impacts.

Unit 4: Social Issues, Legislation, and Practical Applications
Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics. Role of businesses in achieving sustainable development goals and promoting responsible consumption. Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Environmental justice, environmental refugees, and the resettlement and rehabilitation of affected populations; Ecological economics, human population growth, and demographic changes in India.

Readings:

Text Books (Latest Editions):
- Poonia, M.P. *Environmental Studies* (3rd ed.), Khanna Book Publishing Co.
- Bharucha, E. *Textbook of Environmental Studies* (3rd ed.) Orient Blackswan Private Ltd.
- Dave, D., & Katewa, S. S. *Text Book of Environmental Studies*. Cengage Learning India Pvt Ltd.
- Rajagopalan, R. *Environmental studies: from crisis to cure* (4th ed.). Oxford University Press.
- Miller, G.T. & Spoolman S. *Living in the Environment*. (20th ed.). Cengage.
- Basu, M., & Xavier Savarimuthu, S. J. *Fundamentals of environmental studies*. Cambridge University Press.
- Roy, M. G. *Sustainable Development: Environment, Energy and Water Resources*. Ane Books.
- Pritwani, K. *Sustainability of business in the context of environmental management.* CRC Press.
- Wright, R.T. & Boorse, D.F. *Environmental Science: Toward A Sustainable Future* (13th ed,). Pearson.

References

   Web links:
- https://www.ourplanet.com
- https://www.undp.org/content/undp/en/home/sustainable-development-goals.html
- www.myfootprint.org
- https://www.globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem/ecosystem.html

Course Outcome(s):

1. Explore the basic environmental concepts and issues relevant to the business and management field.
2. Recognize the interdependence between environmental processes and socio-economic dynamics.
3. Determine the role of business decisions, policies, and actions in minimizing environmental degradation.
4. Identify possible solutions to curb environmental problems caused by managerial actions.
5. Develop skills to address immediate environmental concerns through changes in business operations, policies, and decisions.

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Transportation problem: Definition, Linear form, North-west corner method, Least cost method, Vogel's approximation method for finding feasible solution, MODI method for finding optimum solution.

Text Books

1. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.
2. Sastry S. S., Introductory Methods of Numerical Analysis, Fifth Edition, PHL, 2022.
3. Taha Hamdy A., Operations Research: An Introduction, Eighth Edition, Pearson Prentice Hall, 2003.
4. S.B. Singh, Discrete Structures, Khanna Book Publishing, 2023 (AICTE Recommended Textbook)

Reference Books

1. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
2. Chakravorty J. G. and Ghosh P. R., Linear Programming and Game Theory, Moulik Library, 2017.
3. Sharma J. K., Operations Research: Theory and Applications, Fourth Edition, Macmilllan Publishers, 2007.

Web Resources

1. https://nptel.ac.in/courses/111107127
2. https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf

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Data Structures

CC104	**25BCA402DS02**	**Data Structures**	**3L:0T:4P**	**5 Credits**
Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer questions covering the entire syllabus. Students must attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory. All questions will carry equal marks.				

Course Objectives

CO1: Understand the fundamental concepts of Data Structures and their applications.
CO2: Develop problem-solving skills using Data Structures.
CO3: Implement Data Structures using C programming language.

Prerequisite:
1. **Programming Fundamentals:** Understanding the basic syntax and semantics of C programming language.
2. **Problem-Solving Skills:** Ability to break down a problem into smaller steps and devise a step-by-step solution and familiarity with simple algorithms.

Course Content:

UNIT I:

Introduction and Overview: Definition, Classification and Operations of Data Structures. Algorithms: Complexity, Time-Space Tradeoff.

Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operations on Linear Arrays: Traversing, Inserting, Deleting, Searching, Sorting and Merging. Searching: Linear Search and Binary Search, Comparison of Methods. Sorting: Bubble Sort, Selection Sort, and Insertion Sort. Two-Dimensional Arrays, Representation of Two Dimensional Arrays in Memory, Matrices and Sparse Matrices, Multi-Dimensional Arrays.

UNIT II:

Linked Lists: Definition, Comparison with Arrays, Representation, Types of Linked lists, Traversing, Inserting, Deleting and Searching in Singly Linked List, Doubly Linked List and Circular Linked List. Applications of Linked Lists: Addition of Polynomials.

Hashing and Collision: Hashing, Hash Tables, Types of Hash Functions, Collision, Collision Resolution with Open Addressing and Chaining.

UNIT III:

Stacks: Definition, Representation of Stacks using Arrays and Linked List, Operations on Stacks using Arrays and Linked List, Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of Postfix Expression.

Recursion: Definition, Recursive Notation, Runtime Stack, Applications of Recursion: Factorial of Number, GCD, Fibonacci Series and Towers of Hanoi.

Queues: Definition, Representation of Queues using Array and Linked List, Types of Queue: Simple Queue, Circular Queue, Double-Ended queue, Priority Queue, Operations on Simple Queues and Circular Queues using Array and Linked List, Applications of Queues.

UNIT IV:

Graphs: Definition, Terminology, Representation, Traversal.

Trees: Definition, Terminology, Binary Trees, Traversal of Binary Tree, Binary Search Tree, Inserting, Deleting and Searching in Binary Search Tree, Height Balanced Trees: AVL Trees, Insertion and Deletion in AVL Tree.

Text Books
1. R.B. Patel, "Expert Data Structures with C", Khanna Book Publishing Company, 2023 (AICTE Recommended Textbook)
2. Seymour Lipschutz, "Data Structures with C", Schaum's Outlines, Tata McGraw-Hill, 2011.
3. Yashavant Kanetkar, "Data Structures Through C", 4th Edition, BPB Publications, 2022.

Reference Books

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2014.
2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, Universities Press, 2007.

Web Resources
1. **GeeksforGeeks** - Data Structures Tutorial
2. **Khan Academy** - Algorithms Course

Lab Programs:
1. Write a program for insertion and deletion operations in an array.
2. Write a program to search for an element in an array using Linear Search and Binary Search.
3. Write a program to sort an array using Bubble Sort, Selection Sort and Insertion Sort.
4. Write a program to merge two arrays.
5. Write a program to add and subtract two matrices.
6. Write a program to multiply two matrices.
7. Write a program to insert an element into a Singly Linked List:
    (a) At the beginning
    (b) At the end
    (c) At a specified position
8. Write a program to delete an element from a Singly Linked List:
    (a) At the beginning
    (b) At the end
    (c) A specified element
9. Write a program to perform the following operations in a Doubly Linked List:
    (a) Create
    (b) Search for an element
10. Write a program to perform the following operations in a Circular Linked List:
    (a) Create
    (b) Delete an element from the end
11. Write a program to implement stack operations using an array.
12. Write a program to implement stack operations using a linked list.
13. Write a program to add two polynomials using a linked lists.
14. Write a program to evaluate a postfix expression using a stack.
15. Write a program to perform the following using recursion:
    (a) Find the factorial of a number
    (b) Find the GCD of two numbers
    (c) Solve Towers of Hanoi problem
16. Write a program to implement simple queue operations using an array.
17. Write a program to implement circular queue operations using an array.
18. Write a program to implement circular queue operations using a linked list.
19. Write a program to perform the following operations on a binary search tree.
    (a) Preorder Traversal
    (b) Inorder Traversal
    (c) Postorder Traversal

20. Write a program to perform insertion operation in a binary search tree.

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Operating Systems

CC105	25BCA402DS03	Operating Systems	3L:0T:2P	4 Credits
Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer questions covering the entire syllabus. Students must attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory. All questions will carry equal marks.				

Course Content:

UNIT I:

Operating Systems Overview: Definition, Evaluation of O.S, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems.
Operating Systems Structures: Operating system services and systems calls, system programs, operating system structure, operating systems generations.

UNIT II:

Process Management: Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads.
Process Scheduling: Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Preemptive and Non-preemptive Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms

UNIT III:

Process Synchronization: Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, Monitors.
Deadlocks: System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks.

UNIT IV:

Memory Management: Logical and Physical address map, Swapping, Memory allocation, MFT, MVT, Internal and External fragmentation and Compaction, Paging, Segmentation.
Virtual Memory: Demand paging, Page Replacement algorithms, Allocation of frames, thrashing.
I/O Management: Principles of I/O Hardware: Disk structure, Disk scheduling algorithms.

हिंदी भाषा संवर्धन–2

Course Code	25HNDX02AE01	Course Credits	2 (L:T:P:) (1:1:0)
Max. Marks	100		

Note: Evaluation will be based on formative assessment.

	Marks distribution
Written test (2 X 10)	20
Peer discussion / Debate / Extempore speech (2X 20)	40
Role play	10
Essay / Article / Report writing	20
Attendance	10
Total	**100**

1. विद्यार्थियों को हिन्दी भाषा के महत्त्व एवं गुणवत्ता से सुविज्ञ करवाकर हिन्दी की ओर उन्मुख करना।

2. रोजगार एवं व्यवसाय के क्षेत्र में हिन्दी को प्रतिष्ठित करना।

3. हिन्दी की वैश्विक स्तर पर प्रतिष्ठा करना।

Course Outcomes:

1. शुद्ध हिन्दी के प्रयोग में अभिवृद्धि होगी।

2. व्यवसाय एवं रोजगार की उपलब्धता वाले सभी क्षेत्रों में हिन्दी भाषा में निष्णात युवाओं की प्रतिभागिता में अभिवृद्धि होगी।

3. अन्तरराष्ट्रीय स्तर पर हिन्दी–भाषा के वर्चस्व की स्थापना होगी और हिन्दी–भाषी को देश और विदेश में समुचित सम्मान मिलेगा।

इकाई–1

पत्रकारिता का अर्थ, उद्भव और विकास, वर्तमान समय में पत्रकारिता का महत्व, हिंदी पत्रकारिता में रोजगार की संभावनाएँ, समाचार लेखन, रिपोर्टिंग, प्रेस विज्ञप्ति, समाचार लेखक की भाषा,

इकाई – II

प्रूफ संशोधन की परिभाषा, प्रूफ शोधक के आवश्यक गुण, प्रूफ के प्रकार, प्रूफ संशोधन के महत्त्वपूर्ण चिह्न, प्रूफ रीडर के लिए आवश्यक सावधानियाँ, प्रूफ संशोधन में रोजगार,

इकाई– III

साक्षात्कार का अर्थ, परिभाषा एवं स्वरूपः कैरियर में साक्षात्कार कौशल का महत्त्व, समालाप्य की भाषा, सम्प्रेषणः अर्थ, परिभाषा एवं प्रक्रियाः भाषा–संप्रेषण के चरणः श्रवण, अभिव्यक्ति, वाचन, लेखनः सम्प्रेषण को प्रभावी बनाने के नियम

इकाई– IV

जीवन कौशल का अर्थ एवं स्वरूपः जीवन कौशल की विशेषताएँ, जीवन कौशल की आवश्यकता एवं महत्त्व, जीवन कौशल के आधारः स्वावलंबन, सहयोगपूर्ण भावना, समस्या समाधान की योग्यता, ज्ञानार्जन की प्रवृत्ति, कुशाग्रता, चातुर्य, मधुर भाषी, संवेदनशील, स्व–जागरूक, अन्वेषणात्मक दृष्टिकोण, उदात्त सुदृढ़–मनोबल, निश्चयात्मकवृत्तिः

प्रेरणास्पद पुस्तकें :

1. डॉ० हरिश्चन्द्र वर्मा, भाषा और भाषाविज्ञान, लक्ष्मी पब्लिशिंग हाऊस, रोहतक 3.

2. सम्पा० कालिका प्रसाद, राजवल्लभ सहाय, मुकुन्दीलाल श्रीवास्तव, बृहत् हिन्दी कोशः ज्ञानमण्डल लिमिटेड, वाराणसी

3. मुख्य सम्पादक, डॉ० लक्ष्मीनारायण शर्मा, परिशोध, मानव–मूल्य विशेषांक, 1993

4. डॉ० धर्मपाल मैनी, भारतीय जीवनमूल्य, भारतीय संस्कृति संस्थान, गुड़गाँव

5. बृहत् प्रशासन शब्दावली, हिन्दी–अंग्रेजी, वैज्ञानिक तथा तकनीकी शब्दावली आयोग, नई दिल्ली–110

Indian Constitution

VAC102	25EVSX01AC01	Indian Constitution	2L:0T:0P	2 Credits

Course Content:

Unit 1: The Constitution - Introduction
•   The History of the Making of the Indian Constitution
•   Preamble and the Basic Structure, and its interpretation
•   Fundamental Rights and Duties and their interpretation
•   State Policy Principles

Unit 2: Union Government
•   Structure of the Indian Union
•   President – Role and Power
•   Prime Minister and Council of Ministers
•   Lok Sabha and Rajya Sabha

Unit 3: State Government
•   Governor – Role and Power
•   Chief Minister and Council of Ministers
•   State Secretariat

Unit 4: Local Administration and Election Commission
•   District Administration
•   Municipal Corporation
•   Zila Panchayat
•   Election Commission
a.   Role and Functioning
b.   Chief Election Commissioner
c.   State Election Commission

Suggested Learning Resources:
1. Ethics and Politics of the Indian Constitution by Rajeev Bhargava, Oxford University Press, New Delhi, 2008
2. The Constitution of India by B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India by DD Basu Lexis Nexis; Twenty-Third, 2018 edition

Suggested Software/Learning Websites:
a.   https://www.constitution.org/cons/india/const.html
b.   http://www.legislative.gov.in/constitution-of-india
c.   https://www.sci.gov.in/constitution
d.   https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

Cases

● Rustom Cavasjee Cooper v. Union of India, (1970) 1 SCC 248

- State of Rajasthan v. Mohan Lal Vyas, AIR 1971 SC 2068 (confirmation of a private monopoly, not a violation of fundamental right)
- Mithilesh Garg v. Union of India, (1992) 1 SCC 168 : AIR 1992 SC 221 (Right to carry on business, not breached when it is liberalised)
- Chintamanrao v. The State of Madhya Pradesh, AIR 1951 SC 118 (scope of reasonable restrictions in relation to trade and occupation)
- Cooverjee B. Bharucha v. Excise Commissioner, Ajmer, AIR 1954 SC 220 (the reasonableness of the restriction imposed may depend upon the nature of the business and prevailing conditions including public health and morality)
- T. B. Ibrahim v. Regional Transport Authority. Tanjore, AIR 1953 SC 79
- Harman Singh v. RTA, Calcutta, AIR 1954 SC 190
- Dwarka Prasad Laxmi Narain v. State of U.P., AIR 1954 SC 224 ● State of Bombay v. R.M.D. Chamarbaugwala, AIR 1957 SC 699
- Parbhani Transport Coop. Society Ltd. v. Regional Transport Authority, Aurangabad, AIR 1960 SC 801
- State of Bombay v. R. M. D. Chamarbaugwala, (1957) S.C.R. 874,
- G.K.Krishnan vs State of Tamil Nadu, 1975 SCC (1) 375
- Automobile Transport (Rajasthan) Ltd. Vs State of Rajasthan, AIR 1962 SC 1406

Course Outcome(s):

Upon completion of this course, students will be able to:

1. Constitutional Framework: Analyze the Indian Constitution's history, Preamble, Fundamental Rights, and basic structure.
2. Union Government Structure: Describe the roles of the President, Prime Minister, and the legislative bodies (Lok Sabha and Rajya Sabha).
3. State Government Mechanisms: Examine the powers of the Governor, Chief Minister, and the State Secretariat.
4. Local Administration: Assess the functioning of local government bodies like District Administration, Municipal Corporations, and Zila Panchayats.
5. Electoral Processes: Analyze the role of the Election Commission in conducting free and fair elections.
6. Application of Knowledge: Apply constitutional principles to contemporary political issues and evaluate governance effectiveness.

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Mathematics Foundation to Computer Science - II

CC103	25BCA402DS01	Mathematics Foundation to Computer Science - II	3L:0T:0P	3 Credits

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer questions covering the entire syllabus. Students must attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory. All questions will carry equal marks.

Course Objectives

CO1: This course helps the students to understand correct lines of arguments and proofs.

CO2: This course introduces mathematical techniques that are foundations for understanding advanced computational methods, including numerical methods and optimization.

CO3: This course helps the students to understand various problem-solving strategies and methods to tackle both theoretical and practical challenges in computer science.

Course Content:

UNIT I:

Logic and Methods of Proofs:

Propositions, logical operations (basic connectives), compound statements, construction of truth table, quantifiers, conditional statements, tautology, contradiction, contingency, logical equivalence. Conjunctive Normal Forms (CNF) and Disjunctive Normal Forms (DNF). Methods of proofs: Rules of inference for propositional logic, modus ponens, modus tollens, syllogism, proof by contradiction, Mathematical Induction.

UNIT II:

Algebraic Structures:

Semi-group, Monoid, Group, Subgroup, Cyclic group.

UNIT III:

Numerical Methods:

Concept and importance of errors in numerical methods.

Solution of algebraic and transcendental equations: Bisection method and Newton-Raphson methods.

Numerical Interpolation: Newton's Forward and Newton's Backward interpolation formula and Lagrange's formula.

Numerical Integration: Trapezoidal rule and Simpson's 1/3 rule Only formula and problem solving for all the topics mentioned above.

UNIT IV:

Optimization Techniques:

Linear programming: Introduction, LP formulation, Graphical method for solving LPs with two variables, Special cases in graphical methods, Simplex method, Duality.

Transportation problem: Definition, Linear form, North-west corner method, Least cost method, Vogel's approximation method for finding feasible solution, MODI method for finding optimum solution.

Text Books

1. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.
2. Sastry S. S., Introductory Methods of Numerical Analysis, Fifth Edition, PHL, 2022.
3. Taha Hamdy A., Operations Research: An Introduction, Eighth Edition, Pearson Prentice Hall, 2003.
4. S.B. Singh, Discrete Structures, Khanna Book Publishing, 2023 (AICTE Recommended Textbook)

Reference Books

1. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
2. Chakravorty J. G. and Ghosh P. R., Linear Programming and Game Theory, Moulik Library, 2017.
3. Sharma J. K., Operations Research: Theory and Applications, Fourth Edition, Macmilllan Publishers, 2007.

Web Resources

1. https://nptel.ac.in/courses/111107127
2. https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf

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Data Structures

CC104	**25BCA402DS02**	**Data Structures**	**3L:0T:4P**	**5 Credits**
Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer questions covering the entire syllabus. Students must attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory. All questions will carry equal marks.				

Course Objectives
CO1: Understand the fundamental concepts of Data Structures and their applications.
CO2: Develop problem-solving skills using Data Structures.
CO3: Implement Data Structures using C programming language.

Prerequisite:
1. **Programming Fundamentals:** Understanding the basic syntax and semantics of C programming language.
2. **Problem-Solving Skills:** Ability to break down a problem into smaller steps and devise a step-by-step solution and familiarity with simple algorithms.

Object Oriented Programming using Java

SEC102	25BCA402SEC01	Object Oriented Programming using Java	3L:0T:4P	5 Credits

Course Objectives
CO1: To introduce the object oriented programming system concepts
CO2: To introduce syntax and semantics of Java programming language CO3:
To develop modular programs using Java
CO4: To setup JDK environment to create, debug and run Java programs

Prerequisite: Knowledge of Problem Solving Techniques using C programming language

Course Content:

UNIT I:
Fundamentals of Object Oriented Programming: Basic Concepts of Object Oriented Programming (OOP), Benefits and Applications of OOP.
Java Evolution: Java Features, Difference between Java, C and C++, Java and Internet, Java Environment.
Overview of Java Language: Introduction to Simple Java Program, Use of Comments and Math function, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java program And JVM, Command Line Arguments.
Text Book 1: Chapters 1, 2 and 3.

UNIT II:
Constants, Variables and Data Types: Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Type casting.
Operators & Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence & Associativity.
Decision Making, Branching & Looping: Decision Making with Control Statements, Looping statements, Jump in loops, Labelled loops.
Text Book 1: Chapters 4, 5, 6, and 7.

UNIT III:
Classes, Objects and Methods: Defining Class, Methods Declaration, Constructors, Methods Overloading, Overriding Methods, Inheritance
Arrays, Strings and Vectors: 1D arrays, Creating an Array, 2D arrays, Strings, Vectors,

Wrapper Classes, Enumerated Types

Inheritance: Defining, extending classes, and Implementing Interfaces. Multiple inheritance and polymorphism.

Text Book 1: Chapters 8, 9, and 10.

UNIT IV:

Packages: Basics of packages, System packages, Creating and accessing packages, Creating user defined packages, Adding class to a package.

Exception Handling: Using the main keywords of exception handling: try, catch, throw, throws and finally; Nested try, Multiple catch statements, Creating user defined exceptions

Text Book 1: Chapters 11 & 13.

Text Books

1. Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India: McGraw Hill Education
2. Schildt, H. (2022). Java: The Complete Reference. 12th edition. McGraw-Hill Education.

Reference Books

1. Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company Private Limited, 2012.
2. Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015.
3. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson, 2008.
4. S. Malhotra and S. Choudhary, Programming in Java, 2nd Edition, Oxford University Press, 2014.

Web Resources

1. https://www.w3schools.com/java/.
2. http://www.java2s.com/.
3. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

List of Practical:

1. Write a program to read two numbers from user and print their product.
2. Write a program to print the square of a number passed through command line arguments.
3. Write a program to send the name and surname of a student through command line arguments and print a welcome message for the student.
4. Write a java program to find the largest number out of n natural numbers.
5. Write a java program to find the Fibonacci series & Factorial of a number using recursive and non recursive functions.
6. Write a java program to multiply two given matrices.
7. Write a Java program for sorting a given list of names in ascending order.
8. Write a Java program that checks whether a given string is a palindrome or not . Ex:MADAM is a palindrome.
9. Write a java program to read n number of values in an array and display it in reverse order.
10. Write a Java program to perform mathematical operations. Create a class called AddSub with methods to add and subtract. Create another class called MulDiv that extends from AddSub class

to use the member data of the super class. MulDiv should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.

11. Create a JAVA class called Student with the following details as variables within it.
    a. USN, NAME, BRANCH, PHONE, PERCENTAGE
    b. Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.

12. Write a Java program that displays the number of characters, lines and words in a text.

13. Write a Java program to create a class called Shape with methods called getPerimeter() and getArea(). Create a subclass called Circle that overrides the getPerimeter() and getArea() methods to calculate the area and perimeter of a circle.

14. Write a Java program to create a class Employee with a method called calculateSalary(). Create two subclasses Manager and Programmer. In each subclass, override the calculateSalary() method to calculate and return the salary based on their specific roles.

15. Write a Java program using an interface called 'Bank' having function 'rate_of_interest()'. Implement this interface to create two separate bank classes 'SBI' and 'PNB' to print different rates of interest. Include additionalm ember variables, constructors also in classes 'SBI' and 'PNB'.

16. Write a Java package program for the class book and then import the data from the package and display the result.

17. Write a Java program for finding the cube of a number using a package for various data types and then import it in another class and display the results.

18. Write a Java program for demonstrating the divide by zero exception handling.

19. Write a Java program that reads a list of integers from the user and throws an exception if any numbers are duplicates.

20. Create an exception subclass UnderAge, which prints "Under Age" along with the age value when an object of UnderAge class is printed in the catch statement. Write a class exceptionDemo in which the method test() throws UnderAge exception if the variable age passed to it as argument is less than 18. Write main() method also to show working of the program.

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Web Technologies

SEC103		Web	1L:0T:2P	2 Credits
	25BCA402SEC02	Technologies		

Course Objectives

CO1: To understand the concepts and architecture of the World Wide Web, Markup languages along with Cascading Style Sheets.

CO2: To understand the concepts of event handling and data validation mechanisms.

CO3: To understand the concepts of embedded dynamic scripting on client and server side Internet Programming and basic full stack web development.

CO4: To develop modern interactive web applications

Prerequisite:

1. Proficiency in at least one programming language, such as Python, Java, or C++. Understanding of programming concepts such as loops, conditionals, functions, and data structures like arrays, lists.

20. Write a program to perform insertion operation in a binary search tree.

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Operating Systems

CC105	25BCA402DS03	Operating Systems	3L:0T:2P	4 Credits

Note: The examiner has to set nine questions in all by setting two questions from each Unit and Question No. 1 consisting of short-answer questions covering the entire syllabus. Students must attempt five questions in all by selecting one question from each Unit and Question No. 1, which is compulsory. All questions will carry equal marks.

Course Content:

UNIT I:

Operating Systems Overview: Definition, Evaluation of O.S, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems.
Operating Systems Structures: Operating system services and systems calls, system programs, operating system structure, operating systems generations.

UNIT II:

Process Management: Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads.
Process Scheduling: Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Preemptive and Non-preemptive Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms

UNIT III:

Process Synchronization: Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, Monitors.
Deadlocks: System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks.

UNIT IV:

Memory Management: Logical and Physical address map, Swapping, Memory allocation, MFT, MVT, Internal and External fragmentation and Compaction, Paging, Segmentation.
Virtual Memory: Demand paging, Page Replacement algorithms, Allocation of frames, thrashing.
I/O Management: Principles of I/O Hardware: Disk structure, Disk scheduling algorithms.

Text Books:
1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022 (AICTE Recommended Textbook)
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition OR Later edition, Wiley India Private Limited, New Delhi.
3. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

Reference Books:
1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India.
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill.

Course Outcomes (COs):

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

CO1: Explain the fundamentals of the operating system.
CO2: Comprehend multithreaded programming, CPU scheduling, process management, process synchronization, memory, deadlocks, and storage management.
CO3: Compare the performance of CPU scheduling algorithms
CO4: Identify the features of I/O and File handling methods.

Operating Systems LAB
List of experiments
1. Write C program to simulate the FCFS CPU Scheduling algorithm.
2. Write C program to simulate the SJF CPU Scheduling algorithm.
3. Write C program to simulate the Round Robin CPU Scheduling algorithm.
4. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
5. Write a C program to implement the Producer – Consumer problem using semaphores.
6. Write a C program to illustrate the IPC mechanism using Pipes.
7. Write a C program to illustrate the IPC mechanism using FIFOs.
8. Write a C program to simulate Paging memory management technique.
9. Write a C program to simulate Segmentation memory management technique.
10. Write a C program to simulate the Best Fit contiguous memory allocation technique.
11. Write a C program to simulate the First Fit contiguous memory allocation technique.
12. Write a C program to simulate the concept of Dining-Philosophers problem.
13. Write a C program to simulate the MVT algorithm.
14. Write a C program to implement FIFO page replacement technique.
15. Write a C program to write a C program for implementing sequential file allocation method.

Course Outcomes (COs):

CO1: To implement scheduling of algorithms.
CO2: Understanding the concept of critical section problems.
CO3: Concepts of file allocation of frames.
CO4: Concept of Page replacement algorithms.

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to use the member data of the super class. MulDiv should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.

11. Create a JAVA class called Student with the following details as variables within it.
    a. USN, NAME, BRANCH, PHONE, PERCENTAGE
    b. Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.
12. Write a Java program that displays the number of characters, lines and words in a text.
13. Write a Java program to create a class called Shape with methods called getPerimeter() and getArea(). Create a subclass called Circle that overrides the getPerimeter() and getArea() methods to calculate the area and perimeter of a circle.
14. Write a Java program to create a class Employee with a method called calculateSalary(). Create two subclasses Manager and Programmer. In each subclass, override the calculateSalary() method to calculate and return the salary based on their specific roles.
15. Write a Java program using an interface called 'Bank' having function 'rate_of_interest()'. Implement this interface to create two separate bank classes 'SBI' and 'PNB' to print different rates of interest. Include additionalm ember variables, constructors also in classes 'SBI' and 'PNB'.
16. Write a Java package program for the class book and then import the data from the package and display the result.
17. Write a Java program for finding the cube of a number using a package for various data types and then import it in another class and display the results.
18. Write a Java program for demonstrating the divide by zero exception handling.
19. Write a Java program that reads a list of integers from the user and throws an exception if any numbers are duplicates.
20. Create an exception subclass UnderAge, which prints "Under Age" along with the age value when an object of UnderAge class is printed in the catch statement. Write a class exceptionDemo in which the method test() throws UnderAge exception if the variable age passed to it as argument is less than 18. Write main() method also to show working of the program.

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Web Technologies

SEC103		Web Technologies	1L:0T:2P	2 Credits
	25BCA402SEC02			

Course Objectives

CO1: To understand the concepts and architecture of the World Wide Web, Markup languages along with Cascading Style Sheets.
CO2: To understand the concepts of event handling and data validation mechanisms.
CO3: To understand the concepts of embedded dynamic scripting on client and server side Internet Programming and basic full stack web development.
CO4: To develop modern interactive web applications
Prerequisite:
1. Proficiency in at least one programming language, such as Python, Java, or C++. Understanding of programming concepts such as loops, conditionals, functions, and data structures like arrays, lists.

2. Familiarity with object-oriented programming (OOP) principles, including classes, objects, inheritance, and polymorphism.

Course Content:

Unit I:
Introduction to HTML, history of HTML, Objective, basic Structures of HTML, Header Tags, body tags, Paragraph Tags.
Tags for FORM Creation, TABLE, FORM, TEXTAREA, SELECT, IMG, IFRAME FIELDSET, ANCHOR.
Lists in HTML, Introduction to DIV tag, NAVBAR Design.

Unit-II:

Introduction to CSS, types, Selectors, and Responsiveness of a web page.
Introduction to Bootstrap, downloads/linking, using classes of Bootstrap, understanding the Grid System in Bootstrap.
Introduction to www, Protocols and Programs, Applications and development tools, web browsers, DNS, Web hosting Provider, Setting up of Windows/Linux/Unix web servers, Web hosting in cloud, Types of Web Hosting.

Unit III:
Introduction to JavaScript: Functions and Events, Document Object model traversing using JavaScript. Output System in JavaScript i.e. Alert, throughput, Input box, Console. Variables and Arrays in JavaScript.Date and String handling in JavaScript.

Unit-IV:

Manipulating CSS through JavaScript: Form Validation like Required validator, length validator, Pattern validator. Advanced JavaScript, Combining HTML, CSS and JavaScript events and buttons, controlling your browser.Introduction to AJAX, Purpose, advantages and disadvantages, AJAX based Web applications and alternatives of AJAX.
Introduction to XML: uses, Key concepts, DTD 8 schemas, XSL, XSLT,and XSL Elements and transforming with XSLT. Introduction to XHTML.
JSON: Introduction to JSON, Keys and Values, Types of Values, Arrays, Objects

Text Books
1. Laura Lemay, Mastering HTML, CSS & Java Script Web Publishing, BPB Publications, 2016
2. Thomas A. Powell, The Complete Reference HTML & CSS, Fifth Edition, 2017

Reference Books
1. Silvio Moreto, Bootstrap 4 By Example, ebook, 2016.
2. Tanweer Alam, Web Technologies, Khanna Book Publishing, 2011.

Web Resources
1. www.javatpoint.com
2. www.w3schools.com
3. https://www.geeksforgeeks.org/web-technology/

Practical list of Programs:

PART-A

1. Create your class time table using table tag.
2. Design a Webpage for your college containing description of courses, department, faculties, library etc. using list tags, href tags, and anchor tags.
3. Create web page using Frame with rows and columns where we will have header frame, left frame, right frame, and status bar frame. On clicking in the left frame, information should be displayed in right frame.
4. Create Your Resume using HTML, use text, link, size, color and lists.
5. Create a Web Page of a super market using (internal CSS) 6.   Use Inline CSS to format your resume that you have created.
7. Use External CSS to format your time table created.
8. Use all the CSS (inline, internal andexternal) toformat college web page that you have created.
9. Write a HTML Program to create your college website using for mobile device.

PART – B

1) Write an HTML/JavaScript page to create login page with validations.
2) Develop a Simple calculator for addiction, subtraction, multiplication and division operation using JavaScript.
3) Use Regular Expressions for validations in Login Page using JavaScript.
4) Write a Program to retrieve date from a text file and displaying it using AJAX.
5) Create XML file to store Student Information like Register Number, Name, Mobile Number, DOB, and Email-Id.
6) Create a DTD for (0).
7) Create XML scheme for (0).
8) Create XSL file to convert XML file to XHTML file.
9) Write a JavaScript program using Switch case.
10) Write a JavaScript program using any 5 events.
11) Write a JavaScript program using built in JavaScript objects.
12) Write program for populating values from JSON text.
13) Write a program to transform JSON text to a JavaScript object.

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