SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)

(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
Accredited by NAAC with 'A+' Grade.
Recognised as Scientific and Industrial Research Organisation
SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23	**II / IV - B.Tech. I - Semester**

CSE (IoT and Cyber Security including Blockchain Technology)

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Category	L	T	P	Cr	C.I.E.	S.E.E.	Total Marks
B23BS2101	Discrete Mathematics and Graph Theory	BS	3	0	0	3	30	70	100
B23HS2101	Universal Human Values -II : Understanding Harmony and Ethical Human Conduct	HS	2	1	0	3	30	70	100
B23CS2101	Digital Logic & Computer Organization	PC	3	0	0	3	30	70	100
B23CI2101	Advanced Data Structures & Algorithm Analysis	PC	3	0	0	3	30	70	100
B23CS2103	Object Oriented Programing Through Java	PC	3	0	0	3	30	70	100
B23CI2102	Advanced Data Structures &Algorithms Analysis Lab	PC	0	0	3	1.5	30	70	100
B23CS2105	Object Oriented Programing through Java Lab	PC	0	0	3	1.5	30	70	100
B23CS2106	Python Programming	SEC	0	1	2	2	30	70	100
B23MC2102	Environmental Science	MC	2	0	0	-	30	-	30
		TOTAL	**16**	**2**	**8**	**20**	**270**	**560**	**830**

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS2101	**BS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DISCRETE MATHEMATICS AND GRAPH THEORY

(Common to CSE, CSBS, AIML, IT, AIDS, CSG, CIC, CSIT)

Course Objectives: Students are expected to

1.	Understand the mathematical arguments using logical connectives and quantifiers and verify the validity of arguments using propositional, predicate logic and truth tables.
2.	Understand various types of relations and discuss various properties of the relations
3.	Know about the concepts of counting techniques and how to solve the recurrence relations.
4.	Understand the concepts in graphs and trees.

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

S.No	Outcome	Knowledge Level
1.	**Use** the concepts of propositional and predicate logic to verify the arguments for their validity.	K3
2.	**Apply** the knowledge of set theory to understand relations, functions and their properties.	K3
3.	**Solve** different counting problems and recurrence relations.	K3
4.	**Use** the concepts of graphs and their representations.	K3
5.	**Determine** different multi graphs and tree structures.	K3

SYLLABUS

UNIT-I (10Hrs)	**Mathematical Logic:** Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.
UNIT-II (10 Hrs)	**Set Theory:** **Sets**: Operations on Sets, Principle of Inclusion-Exclusion, **Relations**: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Lattice and its Properties. **Functions**: Bijective, Composition, Inverse, Permutation, and Recursive Functions.
UNIT-III (12Hrs)	**Combinatorics and Recurrence Relations:** Basis of Counting, Permutations, Permutations with repetitions, Circular and Restricted Permutations, Combinations,

	Restricted Combinations, Binomial and Multinomial Coefficients and Theorems. **Recurrence Relations:** Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations
UNIT-IV (10 Hrs)	**Graph Theory:** Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.
UNIT-V (08Hrs)	**Multi Graphs:** Multi graphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Coloring and Covering, Chromatic Number, Trees and their properties, Spanning Trees-BFS and DFS Spanning Trees, Prim's and Kruskal's Algorithms.

Textbooks:	
1.	Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2.	Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
Reference Books:	
1.	Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
2.	Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.
3.	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
4.	Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
5.	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.
e-Resources :	
1.	https://nptel.ac.in/courses/106105192
2.	https://archive.nptel.ac.in/courses/111/106/111106102/

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23HS2101	**HS**	**2**	**1**	**--**	**3**	**30**	**70**	**3 Hrs.**

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

(Common to all Programmes of Engineering)

Course Objectives: The objective of this course is to make the student aware of

1	Essential complementarity between 'Values' and 'Skills' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2	Harmony in the human being, family, society and nature/existence
3	Holistic perspective towards life, profession and happiness

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

S. No.	Outcome	Knowledge Level
1	**Explain** the role of value education in achieving basic human aspirations.	K2
2	**Summarize** needs to obtain harmony in self(I).	K2
3	**Describe** criteria for human-human relationship and harmony in society	K2
4	**Explain** four orders of nature and our existence	K2
5	**Interpret** significance of harmony in holistic development	K2

SYLLABUS

UNIT-I (9 Hrs)	**Introduction to Value Education:** Understanding Value Education- Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course. Self-exploration as the Process for Value Education - Sharing about Oneself. Myers-Briggs Type Indicator (MBTI) Personality Test. Continuous Happiness and Prosperity – the Basic Human Aspirations and their Fulfilment. Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) - Exploring Human Consciousness. Happiness and Prosperity – Current Scenario. Method to Fulfil the Basic Human Aspirations - Exploring Natural Acceptance-understanding and living in harmony at various levels.
UNIT-II (9 Hrs)	**Harmony in the Human Being:** Understanding Human being as the Co-existence of the Self and the Body. Distinguishing between the Needs of the Self and the Body - Exploring the difference of Needs of Self (I) and Body (Happiness and Physical Facility). The Body as an Instrument of the Self (I)' (I being the doer, seer and enjoyer). Understanding Harmony in the Self(I) - Exploring Sources of Imagination in the Self(I). Harmony of the Self (I) with the Body (characteristics and activities of 'I' and harmony

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	in 'I'). Programme to ensure self-regulation(*Sanyam*) and Health(*Swasth*)- Exploring Harmony of Self (I) with the Body.
UNIT-III (9 Hrs)	**Harmony in the Family and Society:** Harmony in the Family – the Basic Unit of Human Interaction. 'Trust' – the Foundational Value in Relationship- Exploring the Feeling of Trust- intention and competence. 'Respect' – as the Right Evaluation- Exploring the Feeling of Respect. Other Feelings, Justice in Human-to-Human Relationship. Understanding Harmony in the Society- (society being an extension of family). Vision for the Universal Human Order- Exploring Systems to fulfil Human Goal.
UNIT-IV (6 Hrs)	**Harmony in the Nature/Existence:** Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Realizing Existence as Co-existence at All Levels - Understanding Existence as Co-existence of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.
UNIT-V (9 Hrs)	**Implications of the Holistic Understanding – a Look at Professional Ethics:** Natural acceptance of human values. Definitiveness of (ethical) human conduct. A Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Holistic technologies, production systems and management models- typical case studies. Strategies for transition towards value based life and profession (from the present state to Universal Human Order): a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b. At the level of society: as mutually enriching institutions and organizations.

Text Books	
1.	R R Gaur, R Sangal, G P Bagaria. "Human Values and Professional Ethics", Excel Books, New Delhi, 2010
2.	R R Gaur, R Asthana, G P Bagaria. "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Reference Books:	
1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3.	The Story of Stuff (Book).

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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)
e-Resources	
1.	https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
2.	https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php
3.	https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS2101	PC	3	--	--	3	30	70	3 Hrs.

DIGITAL LOGIC & COMPUTER ORGANIZATION

(Common to CSE, CSG, CSIT & CIC)

Course Objectives: The main objective of the course is to provide students with:

1.	A comprehensive understanding of digital logic design principles and computer organization fundamentals.
2.	Describe memory hierarchy concepts.
3.	Explain input/output (I/O) systems and their interaction with the CPU.
4.	Memory and peripheral devices.

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

S.No	Outcome	Knowledge Level
1.	**Apply** digital logic techniques in computer design.	K3
2.	**Use** computer arithmetic operations on Fixed and floating point numbers.	K3
3.	**Explain** instruction execution and how to control information flow in CPU.	K2
4.	**Describe** the organization of various types of memories.	K2
5.	**Explain** the data transfer between devices and optimization of I/O systems for efficient data access and processing.	K2

SYLLABUS

UNIT-I (10Hrs)	Basic Logic Fundamentals, Minimization of Logic expressions using K-Maps, Decoders, Multiplexers, and Encoders, Introduction to Sequential Circuits.
UNIT-II (12 Hrs)	**Basic Structure of Computers:** Von-Neumann Architecture, Register transfer and micro-operations. **Computer Arithmetic:** Fixed and floating-point representation of numbers, Addition, Subtraction, Multiplication and Division algorithms, Floating- point arithmetic operations.
UNIT-III (12 Hrs)	**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation. **Micro programmed Control:** Control Memory, Address Sequencing, Microprogram Example, Design of Control Unit.
UNIT-IV (08 Hrs)	**Memory Organization:** Memory Hierarchy, Auxiliary Memory, Associative Memory, Cache Memory, Virtual memory.

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UNIT-V (08 Hrs)	**Input/output Organization**: Peripheral devices, I/O interface, Asynchronous data transfer, Modes of transfer, Priority interrupt, direct memory access and IOP.
Textbooks:	
1.	Digital Design, 4th Edition, M. Morris Mano, Michael D. Ciletti Pearson Prentice-Hall, 2007.
2.	Computer Systems Architecture, M.Moris Mano, 3rd Edition, Pearson India, 2007.
Reference Books:	
1.	Computer Organization and Architecture, William Stallings, 11th Edition, Pearson India, 2022.
2.	Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th Edition, McGraw Hill India, 2022.
3.	Digital Design and Computer Architecture, 2nd Edition, David Money Harris, Sarah L.Harris, 2019.
e-Resources:	
1.	https://nptel.ac.in/courses/106/103/106103068/

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2101	**PC**	**3**	**--**	**-**	**3**	**30**	**70**	**3 Hrs.**

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

(For CIC)

Course Objectives:

1.	Provide knowledge on advanced data structures frequently used in Computer Science domain.
2.	Develop skills in algorithm design techniques popularly used.
3.	Understand the use of various data structures in the algorithm design.

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

S.No	Outcome	Knowledge Level
1.	Use advanced data structures to organize data and solve connectivity problems.	K3
2.	Analyze the time complexity of Divide and Conquer based algorithms.	K4
3.	Apply Greedy and Backtracking strategies to solve computational problems.	K3
4.	Use Dynamic programming strategy to solve optimization problems.	K3
5.	Determine solutions for combinatorial optimization problems.	K3

SYLLABUS

UNIT-I (12Hrs)	**Trees** : AVL Trees – Creation, Insertion, Deletion operations, Red-Black Trees – Creation, Insertion, Deletion operations, Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications. **Graphs**: Terminology, Representations, Basic Search and Traversals, Connected Components and Bi-connected Components, Euler circuits.
UNIT-II (08 Hrs)	Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. **Divide and Conquer**: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull, Time complexity analysis of divide and conquer algorithms.
UNIT-III (10 Hrs)	**Greedy Method**: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths. **Backtracking**: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem.
UNIT-IV (10 Hrs)	**Dynamic Programming**: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Traveling Salesperson problem.

UNIT-V (10 Hrs)	**Branch and Bound**: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem. **NP Hard and NP Complete Problems**: Basic Concepts, Cook's theorem. NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP).

Textbooks:	
1.	Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition ,Pearson Edu Publishers, 2007.
2.	Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran ,2nd Edition University Press,2008.
Reference Books:	
1.	Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press, 2008.
2.	Data Structures and Algorithms: Concepts, Techniques and Applications – G.A.V.Pai, 1st Edition TataMc Graw Hill Publishers,2017.
3.	Data Structures and program design in C, Robert Kruse, 2nd Edition, ,Pearson Education Asia,2006.
4.	An introduction to Data Structures with applications, Trembley& Sorenson,2nd Edition ,McGraw Hill,2010.
5.	The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison- Wesley, 1997.
e-Resources	
1.	https://www.tutorialspoint.com/advanced_data_structures/index.asp
2.	http://peterindia.net/Algorithms.html
3.	https://github.com/GDSC-KIIT/DSA-Resource?stab=readme-ov-file
4.	https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/?ref=lbp
5.	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS2103	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Common to CSE, AIML, CSG, CSIT & CIC)

Course Objectives:

1.	To identify Java language components and how they work together in applications.
2.	To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries and collections.
3.	To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling, file I/O in Java applications.
4.	To understand how to design applications with threads in Java.
5.	To understand how to use JDBC APIs for program development.

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

S.No	Outcome	Knowledge Level
1.	**Apply** basic Object-Oriented Programming Concepts in Java.	K3
2.	**Use** Arrays, Collections and Strings to solve real world problems.	K3
3.	**Apply** the concepts of Inheritance, Interfaces and Packages for developing reusable programs.	K3
4.	**Apply** the concepts of Multithreading and Exception Handling to build an efficient and error free code.	K3
5.	**Use** Input/Output Streams and JDBC to manage data effectively.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to OOP:** Basic concepts of OOP, Differences between Procedural and Object-Oriented Programming, Advantages of OOP, Applications of OOP. **Introduction to JAVA:** Structure of JAVA, Features of JAVA, Data Types, JAVA Tokens, Control Statements. **Classes & Objects:** Introduction, Class Declaration, Class Members, Declaration of Class Objects, Access Control for Class Members, Static Variables and Methods, User input to programs, Command Line Arguments, Method overloading. **Constructors:** Default Constructor, Parameterized Constructor, Copy Constructor and Constructor Overloading, This Keyword.
UNIT-II (10 Hrs)	**Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Two-dimensional Arrays and Variable Size Arrays. **Collections:** Array List, HashMap and HashSet **String Handling in Java**: Introduction, Methods in String class, String Constant Pool and

	String Buffer class, Wrapper classes, Type Conversion.
UNIT-III (10 Hrs)	**Inheritance:** Introduction, Single inheritance, Multi-level inheritance, Hierarchical Inheritance, Method Overriding, Super Keyword, Final Keyword and Abstract Classes. **Interfaces:** Introduction, Declaration of Interface, Implementing Multiple Inheritance, Extending interfaces, Adapter classes. **Packages:** Introduction, Defining Package, Java util Classes and Interfaces, Java lang Classes, Importing Packages, Sub Packages, Access Modifiers.
UNIT-IV (10 Hrs)	**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords try, catch, throw, throws and finally Blocks, Multiple Catch Statements, Custom Exceptions, Nested try and catch Blocks. **Multithreaded Programming:** Introduction, Thread Life Cycle, Extending Thread class, Implementing Runnable interface, Thread Priorities, Thread Synchronization.
UNIT-V (10 Hrs)	**File IO:** Introduction, Hierarchy of Stream classes, Byte Streams, Character streams. **Java Database Connectivity:** Introduction, Structure of JDBC, JDBC Architecture, Types of JDBC Drivers, JAVA Database connection program for MySQL.

Textbooks:	
1.	The complete Reference Java, 12th edition (2022), Herbert Schildt, Publisher: McGraw Hill.
2.	JdbcApi Tutorial and Reference 3E (2003), by Maydene, Jon Ellis (Author), Jonathan Bruce (Author), Publisher: Addison-Wesley Professional.
3.	Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
Reference Books:	
1.	Introduction to java programming, 9th edition (2014) by Y Daniel Liang, Publisher: Pearson.
2.	Murach's Java Programming, 5th edition (2017) Joel Murach, Publisher: Mike Murach.
3.	JAVA one step ahead, 1stedition (2017) Anitha Seth, B.L.Juneja, Oxford.
4.	Java: A Beginner's Guide, Eighth Edition 8th Edition (2018) by Herbert Schildt, Publisher: McGraw-Hill Education.
5.	Head First Java 3e (2021) (A Brain Friendly Guide) by Kathy Sierra & Bert bates, Publisher: O′Reilly.
6.	Programming with Java: A Primer 6E (2019) By Balagurusamy, Publisher: TMH.
e-Resources	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.coursera.org/learn/java-introduction
3.	https://docs.oracle.com/javase/tutorial/

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2102	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB

(For CIC)

Course Objectives:

1	Acquire practical skills in constructing and managing Data structures.
2	Apply the popular algorithm design methods in problem-solving scenarios.

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

S.No	Outcome	Knowledge Level
1	Demonstrate the basic operations of advanced trees.	K3
2	Apply graph traversal techniques to solve connectivity problems.	K3
3	Analyze the performance of sorting algorithms for various inputs.	K4
4	Apply different algorithm strategies to find solutions for various problems.	K3

SYLLABUS

1	Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2	Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
3	Implement BFT and DFT for given graph, when graph is represented by a) Adjacency Matrix b) Adjacency Lists
4	Write a program for finding the bi-connected components in a given graph.
5	Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
6	Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
7	Implement Job sequencing with deadlines using Greedy strategy.
8	Implement N-Queens Problem Using Backtracking.
9	Use Backtracking strategy to solve 0/1 Knapsack problem.
10	Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
11	Implement Travelling Salesperson problem using Branch and Bound approach.

Reference Books

1	Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Edu Publishers,2002
2	Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2nd

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	Edition University Press,2008
3	Data Structures and program design in C, Robert Kruse, 2nd Edition ,Pearson Education Asia,2006.
E-Resources	
1.	https://www.tutorialspoint.com/advanced_data_structures/index.asp
2.	http://peterindia.net/Algorithms.html
3.	https://github.com/GDSC-KIIT/DSA-Resource?stab=readme-ov-file
4.	https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/?ref=lbp
5.	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS2105	CS	--	--	3	1.5	30	70	3 Hrs.

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

(Common to CSE, AIML, CSG, CSIT & CIC)

Course Objectives:

1	Practice object-oriented programming in the Java programming language
2	Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3	Illustrate inheritance, Exception handling mechanism, JDBC connectivity
4	Construct Threads, Event Handling, implement packages

Course Outcomes:

S.No	Outcome	Knowledge Level
1	**Construct** Basic programs using object-oriented programming principles such as classes, objects, constructors, and polymorphism.	K3
2	**Construct** programs that utilize arrays, collections, and strings to solve a variety of computational problems.	K3
3	**Apply** the concepts of Inheritance, Packages to develop reusable programs.	K3
4	**Develop** robust programs using exception handing, multithreading and File I/O.	K3
5	**Develop** java application to interact with database by using relevant JDBC Driver.	K3

SYLLABUS

1	**Exercise-1 (Basics)** 1. Write a JAVA program to display default value of all primitive data types. 2. Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.
2	**Exercise- 2 (Classes & Constructors)** 1. Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method. 2. Write a JAVA program to implement method overloading. 3. Write a JAVA program to implement constructor overloading. 4. Write a JAVA program to implement this keyword.
3	**Exercise– 3 (Arrays, Vectors, Strings)** 1. Write a JAVA program to search for an element in a given list of elements using binary search mechanism. 2. Write a JAVA program to sort for an element in a given list of elements using bubble sort. 3. Write a JAVA program to implement Operations on Array list.

	4. Write a JAVA program to implement Operations on Hash map. 5. Write a JAVA program to implement Operations on Hash set. 6. Write a JAVA program to implement String Operations. 7. Write a JAVA program to implement String Bufferclass.
4	**Exercise - 4(Inheritance & Interfaces)** 1. Write a JAVA program to implement Single Inheritance. 2. Write a JAVA program to implement multilevel Inheritance. 3. Write a JAVA program for abstract class to find areas of different shapes. 4. Write a JAVA program that implements Runtime polymorphism (Method Overriding) 5. Write a JAVA program to implement "super" keyword. 6. Write a JAVA program to implement Interface.
4	**Exercise-4(Packages & Exception Handling)** 1. Write a JAVA program to implement simple Packages. 2. Write a JAVA program to implement sub Packages. 3. Write a JAVA program to implement the following Builtin Exceptions. i. Arithmetic Exception. ii. Array Index Out of Bounds Exception iii. Number Format Exception. iv. Null Pointer Exception. 4. Write a JAVA program Illustrating Multiple catch clauses 5. Write a JAVA program to implement user defined Exception.
5	**Exercise–5(Multithreading & File IO)** 1. Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and thethirddisplay"Welcome"every3seconds. 2. Write a JAVA program to implement Runnable Interface. 3. Write a program to implement priorities to Thread. 4. Write a JAVA program to implement Thread Synchronization (Multiplication tables) 5. Write a JAVA program to copy contents of file into another using Byte Oriented IO. 6. Write a JAVA program to copy contents of file into another using Character Oriented IO.
6	**Exercise-6 (JDBC)** 1. Write a JDBC program to insert data into database. 2. Write a JDBC program to delete data from database. 3. Write a JDBC program to update data into database. 4. Write a JDBC program to retrieve data from database.
Reference Books:	
1	The complete Reference Java, 12th edition (2022), Herbert Schildt, Publisher: McGraw Hill.
2	Introduction to java programming, 9th edition (2014) by Y Daniel Liang, Publisher: Pearson.
3	Murach's Java Programming, 5th edition (2017) Joel Murach, Publisher: Mike Murach.
4	JdbcApi Tutorial and Reference 3E (2003), by Maydene, Jon Ellis (Author), Jonathan Bruce (Author), Publisher: Addison-Wesley Professional.

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS2106	**SEC**	**--**	**1**	**2**	**2**	**30**	**70**	**3 Hrs.**

PYTHON PROGRAMMING

(Common to CSE, AIML, CSG, CSIT & CIC)

Course Objectives:

1	Introduce core programming concepts of Python programming language.
2	Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
3	Implement Functions, Modules in Python Programming and to create practical and contemporary applications using these.

Course Outcomes:

S.No	Outcome	Knowledge Level
1	**Demonstrate** various operations on Built-in data types & Strings	K3
2	**Solve** Computational Problems using Modular Programming through Functions and Modules	K3
3	**Apply** Data Science methods and techniques on real time data.	K3

SYLLABUS

1	**Introduction:** Introduction to python programming, Installing and Using Jupyter Notebook. **Parts of Python Programming Language:** Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, Dynamic and Strongly Typed Language. **Control Flow Statements:** if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements. **Sample Experiments:** 1. Write a program to find the largest element among three Numbers. 2. Write a Program to display all prime numbers within an interval 3. Write a program to swap two numbers without using a temporary variable. 4. Demonstrate the following Operators in Python with suitable examples. i. Arithmetic Operators ii. Relational Operators iii. Assignment Operators iv. Logical Operators v. Bit wise Operators vi.Ternary Operator vii. Membership Operators viii. Identity Operators 5. Write a program to add and multiply complex numbers

	6. Write a program to print multiplication table of a given number.
2	**Functions & Modules:** Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. Modules: random module, os module. **Strings:** Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings. **Lists:** Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement. **Sample Experiments:** 1. Write a program to define a function with multiple return values. 2. Write a program to define a function using default arguments. 3. Write a program to find the length of the string without using any library functions. 4. Write a program to check if the substring is present in a given string or not. 5. Write a program to perform the given operations on a list: i. addition ii. insertion iii. slicing 6. Write a program to perform any 5 built-in functions by taking any list.
3	**Dictionaries:** Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. **Tuples and Sets:** Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset. **Sample Experiments:** 1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples. 2. Write a program to count the number of vowels in a string (No control flow allowed). 3. Write a program to check if a given key exists in a dictionary or not. 4. Write a program to add a new key-value pair to an existing dictionary. 5. Write a program to sum all the items in a given dictionary.
4	**Files:** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Reading and Writing CSV Files **Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism. **Sample Experiments:** 1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered. 2. Python program to print each line of a file in reverse order.

	3. Python program to compute the number of characters, words and lines in a file. 4. Write a program to create, display, append, insert and reverse the order of the items in the array. 5. Write a program to add, transpose and multiply two matrices. 6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.
5	**Introduction to Data Science:** **NumPy:** NumPy arrays using Array function, Integer Indexing, Array Indexing, Boolean Array Indexing, Slicing and Iterating Arrays, Arithmetic Operations on NumPy arrays, Mathematical Functions in NumPy, changing shape of an array, Stacking and Splitting of arrays, Broad Casting in arrays. **Pandas:** Pandas Series, Pandas Data Frame **Sample Experiments:** 1. Python Program to demonstrate creation of Numpy Arrays. 2. Python program to demonstrate basic slicing, integer and Boolean indexing. 3. Python Program to Manipulate Numpy Arrays. 4. Python program to demonstrate Mathematical and Statistical Operations on Numpy Arrays. 5. Python program to create Series and Data Frame Objects using the sample data. 6. Python Program to demonstrate various operation on Series and Data Frame Objects.
Reference Books:	
1	Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2	Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3	Introduction to Programming Using Python, Y. Daniel Liang, Pearson
E-Resources	
1.	Programming in Python | Coursera
2.	Learn Python - Free Interactive Python Tutorial

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23MC2102	MC	2	--	--	--	30	--	--

ENVIRONMENTAL SCIENCE

(Common to CIC, CSG, CSE, ECE and EEE)

Course Objectives: The objective of the course is to impart:

1.	Overall view on natural resources.
2.	Awareness on ecosystem and its services.
3.	Various environmental challenges induced due to unplanned anthropogenic activities.
4.	Consciousness on the social issues, environmental legislation and global treaties

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

S. No	Outcome	Knowledge Level
1	**Describe** natural resources and their interaction	K2
2	**Illustrate** ecosystem types, biodiversity and conservation strategies	K2
3	**Summarize** contaminants of environment and preventive methods	K2
4	**Explain** protection of environment by employing constitutional provisions	K2
5	**Explain** global scenario of surroundings and social conditions	K2

SYLLABUS

UNIT-I (8 Hrs)	**Multidisciplinary Nature of Environmental Studies:** Definition, Scope and Importance – Need for Public Awareness. Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems. Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people. Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources
UNIT-II (8 Hrs)	**Ecosystems:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **Biodiversity and Its Conservation** : Introduction and Definition - genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity:

	consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
UNIT-III (6 Hrs)	**Environmental Pollution:** Definition, Cause, effects and control measures of: a. Air Pollution. b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides
UNIT-IV (6 Hrs)	**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy watershed management – Resettlement and rehabilitation of people; its problems and concerns – Carbon credits, Mission LiFE. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust –Wasteland reclamation – Consumerism and waste products. Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act. Issues involved in enforcement of environmental legislation – Public awareness.
UNIT-V (6 Hrs)	**Human Population And The Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies. Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books:	
1.	Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2.	Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3.	S. Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4.	K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.
5	K. V. S. G. Murali Krishna, The Book of Environmental Studies, Savera Publishing House.
6	Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
Reference Books:	
1.	Deeksha Dave and S.S. Katewa, Textbook of Environmental Studies, 2/e, Cengage Learning.

2.	M. Anji Reddy, “Textbook of Environmental Sciences and Technology”, BS Publication, 2014.
3.	J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4.	J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5.	G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018
6.	Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2.	https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-lec07.pdf (iasri.res.in)
3.	http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf
4.	https://www.youtube.com/watch?v=5QxxaVfgQ3k

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Regulation: R23	**II / IV - B.Tech. II - Semester**

CSE (IoT and Cyber Security including Blockchain Technology)

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Category	L	T	P	Cr	C.I.E.	S.E.E.	Total Marks
B23HS2201	Managerial Economics and Financial Analysis	HS	2	0	0	2	30	70	100
B23BS2203	Number Theory and its Applications	ES	3	0	0	3	30	70	100
B23CS2201	Operating Systems	PC	3	0	0	3	30	70	100
B23CI2201	Database Management Systems	PC	3	0	0	3	30	70	100
B23CI2202	Computer Networks	PC	3	0	0	3	30	70	100
B23CI2203	Computer Networks & Operating Systems Lab	PC	0	0	3	1.5	30	70	100
B23CI2204	Database Management Systems Lab	PC	0	0	3	1.5	30	70	100
B23CI2205	Full Stack Development-1	SEC	0	1	2	2	30	70	100
B23CI2206	Design Thinking & Innovation	ES	1	0	2	2	30	70	100
B23MC2201	English Proficiency	MC	2	0	0	-	30	-	30
		TOTAL	**17**	**1**	**10**	**21**	**300**	**630**	**930**

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23HS2201	HS	2	--	--	2	30	70	3Hrs.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to AIDS, CSE, CIC, CSG, CSIT, CE, ECE, EEE, ME)

Course Objectives: Students are expected to

1.	Understand the concept and nature of Managerial Economics, its relationship with other disciplines, the Concept of Demand and Demand forecasting
2.	Familiarize about the Concepts of Cost and Break-Even Analysis
3.	Learn about accounting cycle and preparation of Financial Statements
4.	Understand the nature of markets and the Pricing Methods
5.	Know the concept of Capital, Sources of Raising Finance and Depreciation

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

S.No	Outcome	Knowledge Level
1.	**Interpreting** the importance of Managerial Economics, demand analysis and methods of demand forecasting	K2
2.	**Describe** about the usefulness of Cost Analysis and Break Even Analysis	K2
3.	**Apply** the principles of accounting to convert the transactions and events into Journal, Ledger and Trail balance	K3
4.	**Compute** the results of Business by preparing Final Accounts	K3
5.	**Illustrate** the nature of markets and pricing theories	K2
6.	**Explain** the Types of capital, their sources and importance &estimation of Depreciation	K2

SYLLABUS

UNIT-I (12 Hrs)	**Introduction to Managerial Economics and demand Analysis:** **Managerial Economics:** Definition of Economics & Classification of Economics (Micro & Macro), Meaning, Nature, & Scope of Managerial Economics. **Demand Analysis:** Concept of Demand, Determinants of Demand, Demand schedule, Demand curve, Law of Demand and its exceptions. Elasticity of Demand, Types of Elasticity of Demand. Importance of Demand Forecasting and its Methods.
UNIT-II (8 Hrs)	**Cost Analysis**: Importance of cost analysis, **Types of Cost-** Actual cost Vs Opportunity cost, Fixed cost Vs Variable cost, Explicit Vs Implicit cost, Historical cost Vs Replacement cost, Incremental cost Vs Sunk cost; **Elements of costs** – Material, Labour, Expenses; **Methods of costing** - Job costing, contract costing, Process costing, Batch costing, Unit costing, Service costing, Multiple costing. **Break-even analysis:** Determination of Break-even Point Applications, Assumptions and Limitations of Break-even analysis (Theory

	only).
UNIT-III (12 Hrs)	**Introduction to Financial Accounting:** Importance of Accounting - Double Entry System of Accounting - Types of Accounts - Journal, Ledger, Trail Balance, Trading Account, Profit and Loss Account and Balance Sheet (Final Accounts with Simple adjustments).
UNIT-IV (8 Hrs)	**Introduction to Markets & Pricing Policies** **Market Structures:** Salient Features of Perfect Competition, Monopoly, Monopolistic competition, Oligopoly and Duopoly. **Pricing:** Importance of pricing and its meaning; **Methods of Pricing**: **Cost Based** -Full cost, Mark-up, Marginal & Break-even; **Demand Based**-Penetrating, Skimming; **Competition Based-**Going rate, Sealed Bid, Discount; **Internet Pricing** -Flat-rate, Usage sensitive.
UNIT-V (8 Hrs)	**Capital & Depreciation:** Types of Capital-Fixed capital & Working Capital, Components of Working Capital, Factors influencing Working capital. Methods of Raising Finance - Short term, Medium term and Long term. **Depreciation –** Meaning, Importance and causes of depreciation; Methods of Depreciation-Straight line and Diminishing Balancing methods (Theory only).
Text Books:	
1.	AR Aryasri, Managerial Economics and Financial Analysis, TMH Pvt. Ltd, New Delhi
2.	Dr. N. Appa Rao, Dr. P. Vijaya kumar: Managerial Economics and Financial Analysis, Cengage Publications, NewDelhi
Reference Books:	
1.	Dr.B.Kuberudu & T.V.Ramana :Managerial Economics and Financial anaysis, Himalaya Publishing House
2.	Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
3.	Shashi K.Gupta & R.K.Sharma Management Accounting, Kalyani Publishers
4.	Maheswari S.N, An Introduction to Accountancy, Vikas Publishing House Pvt Ltd

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS2203	**ES**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

NUMBER THEORY AND ITS APPLICATIONS

(For CIC)

Prerequisites: Set theory, algebra of functions.

Course Objectives: Students should be able to

1.	Familiarize the concepts of number theory and its applications to information security.
2.	Identify and apply various properties that relates to the integers including the well-ordering principle, primes, unique factorization, division algorithm and congruence.
3.	Impart the knowledge of encryption and decryption techniques and their applications in managing the security of data.

Course Outcomes: Upon successful completion of this course, Student's will

S.No	Outcome	Knowledge Level
1.	**Solve** problems in elementary number theory.	K3
2.	**Solve** congruences, inequalities and computing by CRT	K3
3.	**Apply** Wilson's theorem, Fermat's little theorem and Euler's theorem in applications of congruence.	K3
4.	**Use** Fermat's Factorization method that offers a simple and intuitive way to factorize odd composite numbers into their prime factors.	K3
5.	**Apply** the concepts of cryptography andRSA algorithm which is widely used in trusted public-key encryption that ensures a secure sensitive data in various applications.	K3

SYLLABUS

UNIT-I (10Hrs)	**UNIT – I: Integers, Greatest common divisors and prime Factorization** The well-ordering property-Divisibility-Representation of integers-Computer operations with integers- Prime Numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations
UNIT-II (10 Hrs)	**UNIT – II: Congruence:** Introduction to congruence -Linear congruence-The Chinese remainder theorem-Systems of linear congruence
UNIT-III (10 Hrs)	**UNIT – III: Applications of Congruence:** Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes-Euler's theorem- Euler's phi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT-IV (10 Hrs)	**UNIT – IV: Finite fields & Primality, factoring** Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-Fermat factorization and factor bases.
UNIT-V (10 Hrs)	**UNIT – V: Cryptology** Basic terminology-complexity theorem-Character Ciphers-Block Ciphers-Exponentiation ciphers- Public-key cryptography-Discrete Logarithm-Knapsack ciphers- RSA algorithm.
Textbooks:	
1.	Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories.
2.	A course in Number theory & Cryptography, Neal Koblitz, Springer.
Reference Books:	
1.	An Introduction To The Theory Of Numbers, Herbert S. Zuckerman,Hugh L. Montgomery, Ivan Niven, wiley publishers
2.	Introduction to Analytic number theory-Tom M Apostol, springer
3.	Elementary number theory, VK Krishnan, Universities press
4.	Number Theory and Cryptography, J. H. Loxton, Cambridge University Press
5.	Algorithmic Number Theory: Lattices, Number Fields, Curves and Cryptography, J. P. Buhler, P. Stevenhagen, Cambridge University Press
e-Resources	
1.	https://nptel.ac.in/courses/106103015
2.	https://www.iitg.ac.in/maths/index_syllabus_details.php?slno=aktUMkhSN3hLS283VlducWJtMlV0UT09

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CS2201	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

OPERATING SYSTEMS

(Common to CSE, CSG, CSIT & CIC Branches)

Course Objectives:

1.	Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
2.	Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
3.	Illustrate different conditions for deadlock and their possible solutions.

Course Outcomes: At the end of the course Students will be able to**,**

S.No	Outcome	Knowledge Level
1.	**Explain** the principles of operating systems in diverse computing environments..	K2
2.	**Apply** various process scheduling algorithms and thread management techniques to optimize system performance.	K3
3.	**Implement** synchronization mechanisms and deadlock handling strategies to ensure efficient concurrent system operation	K3
4.	**Analyze** the memory management strategies in OS to optimize the practical computing scenarios.	K4
5.	**Implement** various file allocation methods, fundamental Protection techniques in OS to secure data integrity and accessibility.	K3

SYLLABUS

UNIT-I (10 Hrs)	Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging
UNIT-II (10 Hrs)	Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.
UNIT-III	Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks,

(10 Hrs)	Semaphores, Monitors, Classic problems of Synchronization. Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.
UNIT-IV (10 Hrs)	Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing Storage Management: Overview of Mass Storage Structure, HDD Scheduling.
UNIT-V (10 Hrs)	File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing. Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

Textbooks:	
1.	Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2.	Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016
Reference Books:	
1.	Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2.	Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013
e-Resources	
1.	https://nptel.ac.in/courses/106/106/106106144/
2.	http://peterindia.net/OperatingSystems.html

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2201	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATABASE MANAGEMENT SYSTEMS

(For CIC)

Course Objectives:

1.	Introduce database management systems
2.	Analyze database through systematic database design approaches
3.	Use SQL as a universal Database language
4.	Demonstrate normalization
5	Explain transaction management techniques

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

S.No	Outcome	Knowledge Level
1.	**Describe** database management systems fundamental concepts	K2
2.	**Analyze** databases using Conceptual and Logical database design	K4
3.	**Apply** SQL to Create, maintain and manipulate a relational database	K3
4.	**Apply** normalization for refining database schema	K3
5.	**Illustrate** Transaction management techniques.	K2

SYLLABUS

UNIT-I (08 Hrs)	Introduction: Databases and Database Management Systems, Characteristics of DBMS, DBMS Vs File System, Database Users, Database applications. Brief introduction of different Data Models, Introduction to Relational Database Management Systems, Concepts of Schema, Instance, three tier schema architecture for data independence, Database system structure, Centralized and Client Server architecture for the database.
UNIT-II (10 Hrs)	Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra (select and project) . Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, extended features of ER model, conversion of ER diagrams to tables.
UNIT-III (12 Hrs)	SQL: Simple Database schema, data types, table definitions (create, alter), Creating tables with relationship, implementation of key and integrity constraints, different DML operations (insert, delete, update), Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion). nested queries, sub queries, grouping, aggregation, ordering, relational set

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	operations, implementation of different types of joins, view (updatable and non-updatable).
UNIT-IV (10 Hrs)	Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, closure of functional dependencies, normal forms based on functional dependencies, 1NF, 2NF and 3 NF, Boyce-Codd normal form (BCNF), Lossless join and dependency preserving decomposition MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).
UNIT-V (10 Hrs)	Transaction Concept: Transaction State, ACID properties, Concurrent Execution of transactions, Schedules, Serializability, Recoverability, Testing for Serializability, Lock based and timestamp-based concurrency protocols, Implementation of Isolation, Failure Classification, ARIES Recovery algorithm, Introduction to Indexing Techniques, B+ Trees, operations on B+ Trees, Hash Based Indexing.
Textbooks:	
1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan (Author), Database System Concepts, 7th Edition, TMH, 2021.
2.	Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, Pearson, 2014
Reference Books:	
1.	C.J. Date, A. Kannan and S. Swamy Nathan, An Introduction to Database Systems, 8th Edition, Pearson, 2006.
2.	Elmasri Ramez and Navathe Shamkant, Fundamentals of Database System, 7th Edition, Pearson, 2017.
3.	Corlos Coronel, Steven Morris, Peter Robb, Database Principles Fundamentals of Design Implementation and Management, CBS publishers and Distributors, 2014.
e-Resources	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2202	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

COMPUTER NETWORKS

(For CIC)

Course Objectives:

1.	To understand the different types of networks
2.	To discuss the software and hardware components of a network
3.	To develop an understanding the principles of computer networks.
4.	To Calculate IPv4 subnet addresses proficiently and explain network layer protocols such as IP, ICMPv4, and routing algorithms
5.	To Explain the functionalities of transport layer protocols (TCP and UDP), including flow control, error control, and congestion control mechanisms. Describe common application layer protocols like HTTP, Telnet, and DNS and their respective roles in networking applications.

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

S.No	Outcome	Knowledge Level
1.	**Explain** protocol layering, digital, analog signals, data rates and performance issues in the physical layer	K3
2.	**Explain** transmission media, switching, link layer addressing, and error handling	K2
3.	**Explain** various data link layer protocols	K2
4.	**Calculate** IPv4 subnet addresses, explain network layer protocols	K3
5.	**Explain** transport layer and application layer protocols	K2

SYLLABUS

UNIT-I (10 Hrs)	**Introduction:** Data communications, Networks, Network Types, Standards and administration; Protocol Layering, TCP/IP Protocol suite, OSI Model (introduction); Introduction to Physical layer: Data and Signals, Periodic analog signals, Digital signals, Transmission impairments, data rate limits, performance.
UNIT-II (10 Hrs)	**The Data Link Layer:** Transmission Media: Introduction, Guided media, Un-guided media. Switching: Introduction, Circuit-Switched networks, Packet switching, Structure of a switch. Data Link Layer: Introduction, Link-layer addressing. Error Detection and Correction: Types of errors, Block Coding, Cyclic Redundancy Check, Checksum
UNIT-III (10 Hrs)	**Data Link Control:** DLC Services, Framing, Finite State Machine (FSM), Stop-and-Wait protocol, HDLC, PPP. Media Access Control (MAC): Random Access, ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled access: reservation, polling, token passing. Channelization: FDMA, TDMA, CDMA. Introduction to Ethernet and types of Ethernet

UNIT-IV (10 Hrs)	**Network Layer:** network layer services, packet switching, network layer performance, IPv4 addressing, DHCP, NAT, Forwarding of IP Packets. Network Layer Protocols: Internet Protocol (IP), Datagram Format, ICMPv4, Distance vector and Link state routing. Introduction to IPv6.
UNIT-V (10 Hrs)	**Transport Layer:** Services, flow control, error control, congestion control, Connection-less and connection-oriented protocols, Stop-and-wait, Go-back-N. UDP and TCP segment formats. TCP services, connection establishment, TCP three-way handshake, TCP States and state transition diagram. **Application Layer protocols:** HTTP, Telnet, DNS.

Text books:	
1.	Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication, 2017.
2.	Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6th Edition, Global Edition.
Reference Books:	
1.	James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.
2.	Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.
3.	Computer Networks and Internets, Douglas E Corner, fourth Edition, Pearson Education.
e-Resources	
1.	https://nptel.ac.in/courses/106105183/25
2.	http://www.nptelvideos.in/2012/11/computer-networks.html
3	https://nptel.ac.in/courses/106105183/3

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2203	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

COMPUTER NETWORKS AND OPERATING SYSTEMS LAB

(For CIC)

Course Objectives:

1	Make and test LAN cables and connectors, Analyze network traffic, Use network utility commands.
2	Build Switched LAN networks and configure routers and switches using Packet Tracer simulator.
3	Develop JAVA programs for performing basic network communications.
4	Use Unix commands and develop programs using system calls.
5	Demonstrate file management, CPU scheduling, memory management, IPC features of operating system.

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

S.No	Outcome	Knowledge Level
1	**Make** and test LAN cables using physical tools, analyze network traffic using Wireshark.	K3
2	**Build** LANs and implement routing protocols using Packet Tracer.	K4
3	**Apply** JAVA to perform basic network communication.	K3
4	**Demonstrate** features of Operating Systems using system calls and simulate CPU scheduling, file and memory management algorithms.	K3

SYLLABUS

1	**List of Activities/Experiments (Computer Networks)** a) Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables. Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports. Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation. b) Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup c) Use Packet tracer software to build network topology and configure using Distance vector routing protocol. d) Use Packet tracer software to build network topology and configure using Link State routing protocol.

	e) Using JAVA RMI Write a program to implement Basic Calculator. f) Implement a Chatting application using JAVA TCP and UDP sockets. g) Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbor. Implement Hello and Echo commands using JAVA. h) Using Wireshark perform the following operations: Inspect HTTP Traffic Inspect HTTP Traffic from a Given IP Address, Inspect HTTP Traffic to a Given IP Address, Reject Packets to Given IP Address, Monitor Apache and MySQL Network Traffic.
2	**Experiments covering the Topics** a) UNIX fundamentals, commands & system calls b) CPU Scheduling algorithms, thread processing c) IPC, semaphores, monitors, deadlocks d) Page replacement algorithms, file allocation strategies e) Memory allocation strategies 1. Practicing of Basic UNIX Commands. 2. Write programs using the following UNIX operating system calls. fork, exec, getpid, exit, wait, close, stat, opendir and readdir 3.Simulate the following CPU scheduling algorithms a) FCFS b) SJF c) Priority d) Round Robin 4. Write a program to solve producer-consumer problem using Semaphores. 5. Implement the following memory allocation methods for fixed partition. a) First fit b) Worst fit c) Best fit 6. Simulate the following page replacement algorithm. a) FIFO b) LRU c) LFU 7. Simulate Paging Technique of memory management. 8. Implement Bankers Algorithm for Dead Lock avoidance.
Online Learning Resources:	
1	https://www.netacad.com/courses/packet-tracer - Cisco Packet Tracer.
2	Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
3	https://www.wireshark.org/docs/wsug_html_chunked/ -Wireshark.
4	https://nptel.ac.in/courses/106105183/25
5	http://www.nptelvideos.in/2012/11/computer-networks.html
6	https://nptel.ac.in/courses/106105183/3
7	http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php
8	https://www.cse.iitb.ac.in/~mythili/os/
9	http://peterindia.net/OperatingSystems.html

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Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2204	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

DATABASE MANAGEMENT SYSTEMS LAB

(For CIC)

Course Objectives:

1	Query a database using SQL DDL/DML Commands
2	Use PL/SQL to implement procedures, functions, cursors and triggers
3	Implement a DBMS mini project

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

S. No	Outcome	Knowledge Level
1	**Apply** SQL Commands for defining, constructing and manipulating databases	K3
2	**Demonstrate** PL/SQL to create Procedures, Functions, Cursors, and Triggers.	K3
3	**Apply** database design concepts for a real time problem	K3

SYLLABUS

1	Creating, altering and dropping tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2	Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example: - Select the roll number and name of the student who secured fourth rank in the class.
3	Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4	Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5	i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found) ii. Insert data into the student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6	Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7	Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.

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8	Develop programs using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9	Develop programs using creation of functions, invoke functions in SQL Statements and write complex functions.
10	Develop programs using a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11	Develop Programs using BEFORE and AFTER Triggers, Row and Statement level Triggers
12	Create a table and perform the search operation on the tables using indexing and non-indexing techniques.
13	Mini Project Applying the concepts learnt in the lab.
Add on Programs:	
1	Connect a database using JDBC from a JAVA program.
2	Write a java program using JDBC connection to manipulate data in a database.
3	Create and manipulate a Database using MySQL.
Reference Books:	
1	Bob Bryla and Kevin Loney , Oracle Database 12c The Complete Reference (Oracle Press), McGraw-Hill Education, 2013.
2	Nilesh Shah, Database systems using oracle, 2nd Edition, Pearson Education India, 2016.
3	Der Lans, Van, Introduction To Sql: Mastering The Relational Database Language, 4th Edition(With Cd), Pearson Education India, 2007.
E-Resources	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202245 6_shared/overview

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2205	SEC	0	1	2	2	30	70	3 Hrs.

FULL STACK DEVELOPMENT – 1

(Common to CSE, AIML, CSG, CSIT & CIC)

Course Objectives: The main objectives of the course are to

1	Make use of HTML elements and their attributes for designing static web pages
2	Build a web page by applying appropriate CSS styles to HTML elements
3	Experiment with Java Script to develop dynamic web pages and validate forms

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

S.No	Outcome	Knowledge Level
1	**Use** HTML to implement static web pages	K3
2	**Apply** Cascading style sheets to style HTML documents	K3
3	**Use** Java Script to implement dynamic web pages	K3

SYLLABUS

1	**HTML Lists, Links and Images** a) Write a HTML program, to explain the working of lists. Note**:** It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists. b) Write a HTML program, to explain the working of hyperlinks using<a> tag and href, target attributes. c) Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles. d) Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique
2	**HTML Tables and Forms** a) Write a HTML program, to explain the working of tables. (usetags: <table>, <tr>, <th>, <td> and attributes: border, row span, col span) b) Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cellspacing, cellpadding, border, rowspan, colspan etc.). c) Write a HTML program, to explain the working of forms by designing Registration form.(Note: Include text field, password field, number field, date of birth field, check boxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).

	d) Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, , tags. e) Write a HTML program, to embed audio and video into HTML webpage.
3	**Cascading Style Sheets, Selector forms** Write a program to apply different types of selector forms i. Simple selector (element, id, class, group, universal) ii. Combinator selector (descendant, child, adjacent sibling, general sibling) iii. Pseudo-class selector iv. Pseudo-element selector v. Attribute selector
4	**Types of CSS, CSS with Color, Background, Font, Text and CSS Box Model** a) Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (Identify selector, property and value). b) Write a program to demonstrate the various ways you can reference a color in CSS. c) Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down. d) Write a program using the following terms related to CSS font and text: i. font-size ii. font-weight iii. font-style iv. text-decoration v. text-transformation vi. text-alignment e) Write a program, to explain the importance of CSS Box model using i. Content ii. Border iii. Margin iv. padding
5	**Applying JavaScript-internal and external, I/O, Type Conversion** a) Write a program to embed internal and external Java Script in a webpage. b) Write a program to explain the different ways for taking input and displaying output. c) Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not
6	**JavaScript Pre-defined and User-defined Objects** a) Write a program using document object properties and methods. b) Write a program using window object properties and methods. c) Write a program using math object properties and methods. d) Write a program using string object properties and methods. e) Write a program using regex object properties and methods. f) Write a program using date object properties and methods.
7	**JavaScript Conditional Statements and Loops** a) Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words

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	"LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS". b) Write a program to display week days using switch case. c) Write a program to print 1 to 10 numbers using for, while and do-while loops. d) Write a program to print data in object using for-in, for-each and for-of loops. e) Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. (Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e., 13+ 53+ 33=153). f) Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's& 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1- 1's)
8	**Java Script Functions and Events** a) Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display i. Factorial of that number ii. Fibonacci series up to that number iii. Prime numbers up to that number iv. Is it palindrome or not b) Write a program to validate the following fields in a registration page i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters) ii. Mobile(onlynumbersandlength10digits) iii. E-mail (should contain form at like xxxxxxx@xxxxxx.xxx)
9	**Mini Project**
Reference Books:	
1	Programming the World Wide Web, 7th Edition, RobetWSebesta, Pearson, 2013.
2	Web Programming with HTML5, CSS and JavaScript, John Dean, Jones& Bartlett Learning, 2019 (Chapters 1-11).
3	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.
Web Links:	
1	https://www.w3schools.com/html
2	https://www.w3schools.com/css
3	https://www.w3schools.com/js/

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Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CI2206	ES	1	--	2	2	30	70	3 Hrs.

DESIGN THINKING & INNOVATION

(Common to all Programmes of Engineering)

Course Objectives:

1.	Bring awareness on innovative design and new product development.
2.	Explain the basics of design thinking.
3.	Familiarize the role of reverse engineering in product development.
4.	Train how to identify the needs of society and convert into demand.
5.	Introduce product planning and product development process.

Course Outcomes: After completion of this course, students will be able to

S.No	Outcome	Knowledge Level
1.	**Define** the concepts related to design thinking.	K1
2.	**Explain** the fundamentals of Design Thinking and innovation.	K2
3.	**Apply** the design thinking techniques for solving problems in various sectors.	K3
4.	**Analyse** to work in a multidisciplinary environment.	K4
5.	**Evaluate** the value of creativity.	K5

SYLLABUS

UNIT-I (10Hrs)	Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.
UNIT-II (10 Hrs)	Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development. **Activity:** Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.
UNIT-III (10 Hrs)	Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. **Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.
UNIT-IV (10 Hrs)	Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies. **Activity:** Importance of modeling, how to set specifications, Explaining their own product

	design.
UNIT-V (10 Hrs)	Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. **Activity:** How to market our own product, about maintenance, Reliability and plan for startup.
Textbooks:	
1.	Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2.	Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.
Reference Books:	
1.	David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2.	Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3.	William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4.	Chesbrough.H, The era of open innovation, 2003.
e-Resources:	
1.	https://nptel.ac.in/courses/110/106/110106124/
2.	https://nptel.ac.in/courses/109/104/109104109/
3.	https://swayam.gov.in/nd1_noc19_mg60/preview
4.	https://onlinecourses.nptel.ac.in/noc22_de16/preview

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23MC2201	MC	2	--	--	--	30	--	--

ENGLISH PROFICIENCY

(Common to CSE, CE, ECE, EEE, CIC & CSG).

Course Outcomes: After completion of this course, students will be able to

S No	Outcome	Knowledge Level
1.	**Interpret** IELTS & TOEFL listening comprehension texts.	K2
2.	**Demonstrate** essential speaking skills in academic, professional, and real-life contexts.	K2
3.	**Interpret** the written discourse by applying effective reading strategies.	K2
4.	**Construct** coherent and cohesive paragraphs, e-mails, letters, and essays.	K3

SYLLABUS

UNIT-I	**Listening Skills** Listening as a receptive skill Listening skills for IELTS, TOEFL, Duolingo, PTE, and other competitive examinations.
UNIT-II	**Speaking Skills** JAM/ Extempore Debate / Group Discussion Presentation Skills
UNIT-III	**Reading Skills** Types of Reading (Intensive and Extensive Reading, Skimming, Scanning) Reading/Summarizing News Paper Articles
UNIT-IV	**Writing Skills** Essay Writing (Argumentative, Analytical and Descriptive essays for GRE, TOEFL & IELTS) E-Mail / Letter Writing Resume Writing
UNIT-V	**Integrated Language Skills** Listening Skills for Speaking and Writing Reading Skills for Writing and Speaking

Text Books:

1.	Interchange (5th edition) by Jack C.Richards, CUP, 2017.

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Reference Books:	
1.	Fundamentals of Technical Communication (1st edition) by Meenakshi Raman, Sangeeta Sharma of OUP, 2014.
2.	The Oxford Guide to Writing and Speaking (3rd edition) by John Seely OUP, 2013.
3.	Effective Technical Communication (2nd edition) by M. Ashraf Rizwi. TataMcGrawhill, 2017.
e-Resources:	
1	BBC Learning English - Learn English with BBC Learning English - Homepage
2	Grammar | Learn English (britishcouncil.org)
3	Duolingo English Test
4	IELTS Test Preparation Materials - Videos, Practice tests, Articles and More (idp.com)

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