An Autonomous Institute Approved by AICTE and affiliated to MAKAUT, West Bengal

First Semester Detailed Syllabus

Masters of Computer Applications
(2024-2025)

Department of Computer Applications

Code: CA-101	Paper: Data Structure using C	
Contacts Hours/Week: 4	**Total Contact Hours: 40**	**Credit: 4**

Course Objectives:

This course enables the students to:

1	Provide knowledge of practical implementations and usage of Data Structures.
2	Employ knowledge of various data structures during construction of a program.
3	Develop the logical ability to store and retrieve data efficiently.
4	Develop an appreciation of graph theory-based solutions for real life problems.

Course Outcomes:

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

CO1	Understand the complexity analysis of programs and basic concepts of arrays. [BL-2]
CO2	Learn and Understand the concepts of Stack and Queue and Apply stack and queue in real life problem implementation. [BL-3]
CO3	Learn the concepts of Linked list and implement these concepts in real life problems. [BL-4]
CO4	Understand concepts of Tree and Graph and Apply them to solve real life problems. [BL-3]
CO5	Understand and Apply the concepts of Sorting, Searching and Hashing to solve the complex problem. [BL-4]

Module	COURSE CONTENT
1	**Introduction:** (6L) Data and Information, Definition and Need of Data Structure, Definition of Data Structure, Classification of Data Type, Primitive Data Type, Composite Data Type, Extract Data Type, Implementation of Data Type, Arrays: 1-Dimensional, 2- Dimensional, Multi-Dimensional; Classification of Data Structure, Simple Data Structure, Compound Data Structure, Linear Data Structure, Non-Linear Data Structure, Algorithm Writing and Convention, Characteristics of Algorithm, Analysis and Efficiency of Algorithm, Time and Space Complexity of Algorithm, Algorithm Complexity and Order Notations.
2	**Stacks and Queues:** (8L) ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT Queue, Types of Queues: Simple Queue, Circular Queue, Priority Queue, Double Ended Queue; Operations on each type of Queue: Algorithms and their analysis.
3	**Linked Lists:** (8L) Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list. Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis. Link List representation of Stack and Queue. Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.
4	**Trees and Graphs:** (9L) Trees: Terminology, Different types of Trees, Representation, Binary Trees, Threaded Binary Tree, Binary Search Trees, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis; Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis; Graph: Graph Terminology, Representation of graphs, Path Matrix, Graph Traversal, Shortest Path Problems, Topological Sort.
5	**Sorting and Searching:** (9L) Sorting: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods. Searching: Linear Search and Binary Search Techniques and their complexity. Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Closed Addressing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing.

Reference Books:

- Tannenbaum, Data Structure Using C and C++, PHI.
- Loudan, Mastering Algorithms With C, SPD/O'REILLY.
- Kruse, Tondo and Leung, Data Structures and Program Design in C,2nd Ed, PHI.
- Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures of C, Susan Anderson-freed.
- Seymour Lipschutz, Data Structure, McGraw Hill Education.

Code: CA-102	Paper: Concepts of Object-Oriented Programming	
Contacts Hours/Week: 4	Total Contact Hours: 40	Credit: 4

Course Objectives:

This course enables the students to:

1	Comprehend basic and object-oriented concepts in OOPs & libraries of C++, JAVA.
2	Use and develop various concepts of OOPs to solve problems.
3	Design and building real-time applications with an event-driven graphical user interface accessing files or database.

Course Outcomes:

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

CO1	Learn the characteristics of OOPs. Identify variables and data types in program development.
CO2	Demonstrate the concepts of classes, objects, member methods, method overloading, access control.
CO3	Apply the concepts of inheritance and exception handling to develop efficient and error free codes.
CO4	Apply the concepts of Packages and Multi-threading for integration of packages and optimize threading.
CO5	Evaluate the application of using Windows based collection framework, file handling generics to solve real life problem.

Module	COURSE CONTENT
1	**Introduction to Object-Oriented Programming:** (9L) Introduction: Basic concepts of OOPs, Advantages of OOP, characteristics of object-oriented languages, Object, Classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic binding, Message Passing, keywords, identifiers, data types, manipulators, Operators in C++, Operator Precedence, Typecast operator, Control structures, Loops. How java differs from C and C++, World Wide Web, web browser. String and Arrays. Java Environment: Java Development Kit(JDK), Application Programming Interface(API), java programming structure, java tokens, constants, variables, expressions, decision making statements and looping, java statements, overview of arrays and strings, machine neutral, Java Virtual Machine(JVM), Command Line Arguments.
2	**Functions, Objects and Classes, Operator Overloading:** (6L) Functions: Function Prototyping, Default and Constant Arguments, Inline Function, functions Overloading, Friend and virtual Functions, static function. Objects and classes: Specifying class & object, Arrays as class member data, Arrays of objects, Constructors and Destructors, objects as function arguments. Operator Overloading: Overloading Unary & Binary operators.
3	**Inheritance, Managing Errors and Exceptions:** (5L) Inheritance: introduction, defining derived classes, overriding member functions, Single Inheritance, multilevel Inheritance, multiple Inheritance, Hierarchical Inheritance, Virtual Base Class. Managing Errors and Exceptions: Introduction, types of errors: compile time and run-time errors, exceptions, types of exceptions, syntax of exception handling code, multiple catch statements, using finally statement, throwing our own exceptions.
4	**Interfaces, Package and Multi-threaded Programming:** (10L) Interfaces: Introduction, defining interfaces, extended interfaces, implementing interfaces. Package: Creation, importing a package and user-defined package. Threads: Introduction to threads, creating threads, extending the thread class, implementing the 'runnable' interface, life-cycle of a thread, priority of a thread, synchronization, and deadlock.
5	**Working with Windows:** (10L) Applet programming: Introduction, how applets differ from applications, building applet code, applet life cycle, about HTML, designing a web page, passing parameters to applets, getting input from the user. Graphics Programming: Introduction, abstract window toolkit class hierarchy, frames, event-driven programming, layout managers, panels, canvases, drawing geometric figures. Introduction to Swings: Introduction to Swings, overview of Swing components: Jbutton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList. Introduction to Networking: InetAddress class, socket class, URL class.

Reference Books:

- Herbert Schildt, The Java Complete References, 9/e, Tata McGraw Hill.
- Y. Daniel Liang, An Introduction to JAVA Programming, Tata McGraw Hill.
- E. Balaguruswamy, Programming with JAVA, 2/e, Tata McGraw Hill.

Code: CA-103	**Paper: Computer Organization and Architecture**	
Contacts Hours/Week: 4	**Total Contact Hours: 40**	**Credit:** 4
Course Objectives:		
This course enables the students to:		
1	Impart knowledge on the fundamentals of digital systems.	
2	Describe the logical functioning of the circuits to the learners.	
3	Learn different architectures & organizations of Input-Output.	
4	Learn different architectures & organizations of memory systems.	
5	Learn different architectures & organizations processor organization and control unit.	
Course Outcomes:		
After the completion of this course, students will be able to:		
CO1	Understand the basic concepts of digital logic, including binary numbers, Boolean algebra, and logic gates.	
CO2	Design and analyze combinational and sequential logic circuits.	
CO3	Understand the basic structure and functioning of a computer system input/output (I/O) system.	
CO4	Learn about memory management techniques and their role in computer system performance.	
CO5	Understand the concepts of data paths, control units, and how they are used to implement the execution of instructions in a CPU.	
Module	**COURSE CONTENT**	
1	**Overview And Basics of Digital Computer:** Number System, Conversion, Complementation Computer Arithmetic, Logical Gates. Boolean algebra, Simplification of Boolean expression	(8L)
2	**Logic Circuits:** Adders, and Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder Flip flops: SR Flip flop, D Flip flop, JK Flip flop, T Flip flop. Registers, Shift Registers, Asynchronous counters, Synchronous counters, Ring counter	(12L)
3	**Input-Output Organization:** Input/ Output devices, Interrupts, Data transfer schemes, programmed I/O and DMA	(4L)
4	**Memory Organization:** Memory Hierarchy, Primary memory, Secondary Memory, Magnetic Tape, Magnetic Disk, Optical disk, Magneto-Optical Disk, Concepts of auxiliary, Associative, Cache and Virtual Memory, DMA Transfer modes, sequential access, direct access storage devices.	(8L)
5	**CPU Organization:** CPU Building Blocks, CPU Registers and BUS Characteristics, Registers and System Bus Characteristics. Instruction Format: Addressing Modes, Interrupts Concepts and types, Instruction and Execution Interrupt cycle, Hardwired and Micro Program control, Introduction to RISC and CISC, Hazards. Instruction Pipelining, Arithmetic Pipelining.	(8L)
Reference Books:		
• M. Moris Mano, Computer System Architecture, PHI Publication. • Pal Chaudhary, Computer Organization and Architecture, PHI Publication. • Tanenbaum, Structured computer organization, Pearson Education.		

Code: CA-104	Paper: Discrete Mathematics	
Contacts Hours/Week: 4	**Total Contact Hours: 40**	**Credit: 4**

Course Objectives:

This course enables the students to:

1	Introduce concepts of mathematical logic for analyzing propositions and proving theorems.
2	Use sets, relations and functions for solving applied problems and use the properties of Algebraic structure.
3	Introduce the concepts of Generating function and recurrence relation for solving the real-world problems.
4	Introduce basic concepts of graphs, digraphs and trees.
5	Introduce concepts of several algorithms of Graph & Trees.

Course Outcomes:

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

CO1	Understand and Apply Propositional logic, Disjunctive and Conjunctive Normal Forms, Logical equivalence. Understand and evaluate mathematical problem with the help of mathematical Induction. [BL-5]
CO2	Remember, Understand and Analyzing Set Theory, Mapping, Relation, POSET, Group, Ring and Fields. Understand and Apply Boolean Algebra. [BL-4]
CO3	Understand, Analyze and Apply of Generating functions, Recurrence relations and Permutation-Combination in to complex problems. [BL-5]
CO4	Understand and Apply basic Graph Theory and tree in computer science field. [BL-3]
CO5	Apply and Evaluate the real problems of spanning tree, shortest path and graph traversing. [BL-5]

Module	COURSE CONTENT
1	**Propositions and Logical Operations:** (6L) Notation, Connections, Normal forms, Truth Tables; Propositional Equivalence and Implications; Predicates and quantifiers, Nested quantifiers, Rules of inference; Predicate calculus Principles of Mathematical Induction.
2	**Set, Boolean Algebra & Group:** (12L) Set, Relation & Function: Operations and Laws of Sets, Equivalence Relation, Partial Order Relation, POSET, Lattice, Function (Injective, Surjective, Bijective), Inverse of Function. Fuzzy set, Basic properties of fuzzy set. Boolean Algebra: Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form. Algebraic Structure: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Properties of Group, Congruence Relation and Quotient Structures, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields.
3	**Generating Function & Recurrence Relation:** (8L) Generating Functions: Introductory examples, definitions and examples, partition of integers, exponential generating functions, summation operator. Recurrence Relation: Solve the recurrence relation by Iteration method, Homogeneous and non-homogeneous method for solving the recurrence relation and solve by generating function method. Permutation & Combination: Concepts of permutation and combination, solve mathematical problems of different conditions of permutation and combination.
4	**Graph & Tree:** (8L) Graph Theory: Definitions and examples, Sub graphs, vertex degree, Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Representation of Graph, Planner graphs, Hamiltonian paths and cycles, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Isomorphism, Homomorphism of Graphs. Trees: Definitions, Properties and examples, Rooted Trees, spanning trees and minimum spanning trees.
5	**Algorithms:** (8L) Kruskal's & Prim's Algorithm for minimum spanning tree, Dijkstra's, Flyod's & Warshall's for shortest path, DFS, BFS.

Reference Books:

- T Veerarajan, Discrete Mathematics, with Graph Theroy and Combinatorics, McGraw Hill Education.
- Swapan Kumar Sarkar, A Textbook of Discrete Mathematics, S. Chand.
- M. Moris Mano, Computer System Architecture, PHI Publication.
- C. L. Liu, Discrete Mathematical Structure, McGraw Hill Education
- G. S. RAO, Discrete Mathematical Structure, New Age International.
- Narsingh Deo, Graph Theory With Applications To Engineering And Computer Science, PHI Learning.

Code: CA-105A	Paper: Constitution of India	
Contacts Hours/Week: 3	**Total Contact Hours: 30**	**Credit: 3**

Course Objectives:

This course enables the students to:

1	Equip the student with the basic knowledge of Indian Constitution in order to make them a responsible citizen and assertive in their approach towards the societal issues.

Course Outcomes:

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

CO1	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO2	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
CO3	To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Module	COURSE CONTENT
1	**History of Making of the Indian Constitution:** (5L) History Drafting Committee, (Composition & Working)
2	**Philosophy of the Indian Constitution:** (5L) Preamble Salient Features.
3	**Contours of Constitutional Rights & Duties :** (5L) Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.
4	**Organs of Governance:** (5L) Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.
5	**Local Administration:** (5L) Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.
6	**Election Commission:** (5L) Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission, Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Reference Books:

- The Constitution of India, 1950 (Bare Act), Government Publication.
- Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1/e, 2015.
- M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
- D. D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Code: CA-105B	**Paper: Health and Life Style Management through Yoga**	
Contacts Hours/Week: 3	**Total Contact Hours: 30**	**Credit: 3**
Course Objectives:		
This course enables the students to:		
1	Acquires concept the meaning and important of healthy life style.	
2	Apply the principles of health.	
3	Understanding the meaning of health and life, dietary principles and life style principle.	
4	Practice and applied the health guidelines.	
5	Identify the personal responsibilities and to reduce health risk.	
6	Develop the personal fitness.	
Course Outcomes:		
After the completion of this course, students will be able to:		
CO1	To make awareness to the students regarding health.	
CO2	To promote health concept and self-discipline.	
CO3	To follow healthy dietary habits.	
Module	**COURSE CONTENT**	
1	**Introduction:** (6L) Introduction, Health, Meaning, Definition, Concept, Importance, Principles, Diet and nutrition, Eating Pattern, Yogic Diet, Proper Exercise, Benefit of regular exercise, Yoga Asana Practice.	
2	**Philosophy of the Indian Constitution:** (6L) Preamble Salient Features.	
3	**Development of Life Skills:** (6L) Skills and Manners, Communication Skills, Body Language, Time Management, Conflict Management, Relationship Management.	
4	**Principles of Yoga:** (6L) Method of Living Through Yoga, Four Paths of Yoga, Seven Spiritual Laws, Principles of Life, Achar, Vichar, Akar, Vikar, Artha, Kama, Dharma, Moksha.	
5	**Meditation:** (6L) Meaning, Methods, Techniques, Obstacles, Tools of Meditation, Benefits of Meditation, Sanskar, Re-engineering, Brain, Re-Wiring, Elimination of Negative Thought, Stress Management through Yoga.	

Reference Books:

- Brahma Kumaris Education Wing, Managing the Self, Mount Abu, Rajasthan, 2014.
- Swami Abhedananda, Yoga Psychology, Ramakrishna Mutt, Calcutta, 1967.
- Ulka Ajit Natu, Yoga for Health, Health, Healing and Harmony, 2008.
- Swami Vishnu Deva Nandha, Meditation, Divine Life Society Publication, 1998.
- Uthappa, Stress Management through Yoga Motilal Bernarshi Doss Publication, 1997.
- Ravi Saxena, Health and Physical Education, Anmol Publications, 2005.
- Prof. T. Mrunalini, Yoga Education, Neelkamal Publications, 2014.

Code: CA-105C	Paper: Ethics in Business Profession	
Contacts Hours/Week: 3	**Total Contact Hours: 30**	**Credit: 3**
Course Objectives:		
This course enables the students to:		
1	Provide an introduction to business ethics, including the exploration of employee issues and responsibilities, leadership and decision-making, morality, diversity, discrimination, ethics in marketing and advertising, and corporate social responsibility.	
Course Outcomes:		
After the completion of this course, students will be able to:		
CO1	Earn about morals, values & work ethics, learn to respect others and develop civic virtue.	
CO2	Learn about the ethical responsibilities of the engineers, create awareness about the customs and religions, Install Moral and Social Values and Loyalty and to appreciate the rights of others.	
CO3	Demonstrate knowledge to become a social experimenter, provide depth knowledge on framing of the problem and determining the facts.	
CO4	Create awareness about safety, risk & risk benefit analysis, Provide knowledge on Intellectual Property Rights.	
CO5	Develop knowledge about global issues, create awareness on computer and environmental ethics, Analyze ethical problems in research.	
Module	**COURSE CONTENT**	
1	**Human Values:** (6L) Morals, Values and Ethics-Integrity-Work Ethic-Service learning, Civic Virtue, Respect for others, Living Peacefully, Caring, Sharing, Honesty, Courage-Cooperation, Commitment, Empathy, Self Confidence Character.	
2	**Professional Ethics:** (6L) Senses of 'Professional Ethics-Variety of moral issued, Types of inquiry, Moral dilemmas, Moral autonomy, Kohlberg's theory-Gilligan's theory, Consensus and controversy, Models of professional roles, Theories about right action, Self-interest, Customs and religion.	
3	**Professional As Social Experimentation:** (6L) Profession As Social Experimentation, Framing the problem, Determining the facts, Codes of Ethics, Clarifying Concepts, Application issues, Common Ground, General Principles, Utilitarian thinking respect for persons.	
4	**Safety, Responsibilities and Rights in Profession:** (6L) Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Professional Rights, Employee Rights, Intellectual Property Rights (IPR), Discrimination.	
5	**Global Issues:** (6L) Globalization, Cross culture issues, Environmental Ethics, Computer Ethics, Computers as the instrument of Unethical behavior, Computers as the object of Unethical acts, Autonomous Computers, Computer codes of Ethics, Moral Leadership, Code of Conduct, Corporate Social Responsibility. Ethics and Research, Analyzing Ethical Problems in research.	

Reference Books:

- Govindarajan M, Natarajan S, Senthil Kumar V. S, Engineering Ethics, Prentice Hall of India, New Delhi.
- A. R. Aryasri, DharanikotaSuyodhana, Professional Ethics and Morals, Maruthi Publications.
- Mike W. Martin and Roland Schinzinger, Ethics in Engineering, Tata McGraw Hill, New Delhi.
- John R Boatright, Ethics and the Conduct of Business, Pearson Education, New Delhi.

Code: CA-105D	Paper: Environmental Science	
Contacts Hours/Week: 3	**Total Contact Hours: 30**	**Credit: 3**

Course Objectives:

This course enables the students to:

1	Investigate the complexities of the natural environment and our relationship with it.
2	Explore the problems we face in understanding our natural environment and in living sustainability.
3	Develop scientific, interpretive and creative thinking skills.
4	Learn to apply quantitative analysis and field research techniques.

Course Outcomes:

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

CO1	Understand the natural environment and its relationships with human activities.
CO2	Apply the fundamental knowledge of science and engineering to assess environmental and health risk.
CO3	Understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
CO4	Solve scientific problem-solving to air, water noise and land pollutions.

Module	COURSE CONTENT
1	**Introduction:** (4L) Basic ideas of environment and interrelationship among man society and environment, Environmental problems and issues, Segments of environments, Natural Cycles of environments, Mathematics of population growth and its associated problems, Logistic population growth.
2	**Elements of Ecology:** (3L) Open and closed system ecology, species, population, community, definition of ecosystem, components types and functions, Environmental perspectives, Montreal protocol.
3	**Pollutants and Contaminants:** (3L) Definition of primary and secondary pollutants and contaminants, Source and effects of different air pollutants suspended particulate matter, oxides of carbon, nitrogen, Sulphur particulate.
4	**Air Pollution:** (5L) Structures of the atmosphere, global temperature models, Greenhouse effect, global warming, acid rain, causes, effects and control, Lapse rate and atmospheric stability, pollutants and contaminants, smog, depletion of ozone layer, standards and control measures of air pollution.
5	**Water Pollution:** (5L) Hydrosphere, pollutants of water: origin and effects, oxygen demanding waste, thermal pollution, pesticides, salts. Biochemical effects of heavy metals, eutrophication: source, effect and control, Water quality parameters: DO, BOD, COD. Water treatment: surface water and wastewater.
6	**Land Pollution:** (5L) Land pollution: sources and control; solid waste: classification, recovery, recycling, treatment and disposal.
7	**Noise Pollution:** (5L) Noise: definition and classification, noise frequency, noise pressure, noise intensity, loudness of noise, noise threshold limit value, noise pollution effects and control.

Reference Books:

- G. K. Das Mahapatra, Basic Environmental Engineering and Elementary Biology, Vikas Publishing House
- A. K. De, Environmental Chemistry, New Age International.
- G. M. Masters, Environmental Engineering, Tata Mc Graw Hills.
- A. K. Das, Environmental Chemistry with Green Chemistry, Books and Allied P. Ltd.
- D. De, D. De, Fundamentals of Environment & Ecology, S. Chand & Company Ltd.

Code: CA-181	**Paper: Soft Skills & Interpersonal Communication**	
Contacts Hours/Week: 4	**Total Contact Hours: 40**	**Credit: 2**
Course Objectives:		
This course enables the students to:		
1	Develop inter personal skills and be an effective goal-oriented team player.	
2	Develop professionals with idealistic, practical and moral values.	
3	Develop communication and problem-solving skills.	
4	Shaping attitude and understanding its influence on behavior.	
5	Encourage the all-round development of students by focusing on Soft Skills.	
Course Outcomes:		
After the completion of this course, students will be able to:		
CO1	Effectively communicate through verbal / oral communication and improve the listening skills.	
CO2	Able to be self-confident with positive vibes.	
CO3	Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.	
CO4	Become more effective individual through goal / target setting, self-motivation and practicing creative thinking.	
CO5	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.	
Module	**COURSE CONTENT**	
1	**Soft Skills & Interpersonal Communication:** (8L) An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation.	
2	**SWOT & Creative Thinking:** (8L) Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.	
3	**Corporate Communication:** (8L) Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking. Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective. Interview & Presentation Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.	
4	**Non-Verbal Communication & Personality Development:** (8L) Importance and Elements; Body Language. Concept, Essentials, Tips Definition, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.	
5	**Business Etiquette & Team Work:** (8L) Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.	
Reference Books:		

- B. N. Ghosh, Managing Soft Skills for Personality Development, McGraw Hill India, 2012.
- Nitin Bhatnagar, Effective Communication and Soft Skills, Pearson Education India, 2011.
- S. P. Dhanavel, English and Soft Skills, Orient Blackswan India, 2010.

Code: CA-191	**Paper: Data Structure Lab using C**	
Contacts Hours/Week: 4	**Total Contact Hours: 40**	**Credit: 2**
Course Objectives:		
This course enables the students to:		
1	Introduce the fundamental concept of data structures.	
2	Emphasize the importance of data structures in implementing the algorithms.	
3	Develop effective skills in the implementation of data structure.	
4	Linear data structures and their applications such as stacks, queues and lists.	
5	Non-Linear data structures and their applications such as trees andgraphs.	
Course Outcomes:		
After the completion of this course, students will be able to:		
CO1	Understand linear and non-linear data structures.	
CO2	Know how to create application specific data structure using stack & queue.	
CO3	Apply the Concept of linked list to solve real life problems.	
CO4	Apply and Solve the real life problems using various algorithms of trees & graphs.	
CO5	Understand different types of sorting and searching techniques.	
Module	**COURSE CONTENT**	
1	**Basic Data Structure Operations:** (2L) Implementation of data structure operations (Insertion, deletion, traversing, searching) on array. Linear search, Binary search.	
2	**Implementation & applications of Stack & Queue:** (10L) Implementation of stack, queue operation using array and Linked List. Implementation of circular queue. Infix to postfix / prefix conversion, postfix expression evaluation.	
3	**Implementation of linked lists:** (12L) Single linked list, circular linked list, double linked list, doubly circular linked list. Implementation of stack and queue using linked list, Linked list representation of a polynomial, polynomial addition, polynomial multiplication.	
4	**Tree & Graph:** (8L) Tree: creating Binary Search tree, recursive and non-recursive traversal of BST, deletion in BST, calculating height of a BST, building AVL tree. Implementation of Graph: representation, searching, BFS, DFS.	
5	**Sorting & Searching:** (8L) Implementation of sorting techniques: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort,implementation of priority queue. Implementation of searching techniques: Linear, Binary. Hash table implementation.	

Reference Books:

- Tannenbaum, Data Structure Using C and C++, PHI.
- Loudan, Mastering Algorithms With C, SPD/O'REILLY.
- Kruse, Tondo and Leung, Data Structures and Program Design in C,2nd Ed, PHI.
- Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures of C, Susan Anderson-freed.
- Seymour Lipschutz, Data Structure, McGraw Hill Education.

Code: CA-192	**Paper: Object-Oriented Programming Lab**	
Contacts Hours/Week: 4	**Total Contact Hours: 40**	**Credit: 2**

Course Objectives:

This course enables the students to:

1	Learn Language Features.
2	Use and develop various concepts of OOPs to solve problems.
3	Design and build real-time applications with an event-driven graphical user interface accessing files or database.

Course Outcomes:

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

CO1	Reproduce fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
CO2	Identify the Java SDK environment to create, debug and run simple Java programs.
CO3	Illustrate classical problems using java programming.
CO4	Experiment with problems related to inheritance, polymorphism, interfaces, packages, multithreading, file handling, collections framework.
CO5	Construct the generic programming.

Module	**COURSE CONTENT**
1	Language Features.
2	Arrays in Java and String Handling.
3	Classes and Objects.
4	Inheritance.
5	Interface and Package.
6	Exception Handling.
7	Multithreading.
8	java.util, java.lang, java.io.

Reference Books:

- Herbert Schildt, The Java Complete References, 9/e, Tata McGraw Hill.
- Y. Daniel Liang, An Introduction to JAVA Programming, Tata McGraw Hill.
- E. Balaguruswamy, Programming with JAVA, 2/e, Tata McGraw Hill.