B.Sc.CS Semester – II (First Year)

B.Sc.CS Semester - II Syllabus

B.Sc. (CS) Semester – II (First Year)

Subject Title : **Object Oriented Programming**
Subject Code : **CSM203-1C**
Subject Type : **Major**

Rationale:

Understand basic concepts of Object-Oriented Programming.

Learning Outcomes:

After studying this subject

- Students will able to solve problem related to real life entities by using inheritance, templates.

- Students will be able to develop functions.

Teaching and Evaluation Scheme:

Credit	Duration in Hours		Maximum Marks		
	Theory	**Practical**	**CCE (Formative)**	**SEE (Summative)**	**Total**
4 (2+2)	30	60	50	50	100

Course Content

Unit I   **[Weightage=25% approx., Lectures=7, Practicals= 16]**

Overview of C++: Introduction to features of object-oriented programming v/s procedural programming, OOP Basic Concepts, Basic Syntax and Structure, Data Types and Modifiers, Variables, Operators, sizeof and typedef, Decision Making, Loop Types, Storage Classes, Function Prototyping, Call by Reference, Return by Reference

Unit II   **[Weightage=25% approx., Lectures=7, Practicals= 14]**

Core C++ Concepts: Classes and Objects: Defining Class and Object, Access Controls in Classes, Accessing Data Members, Member Functions in class, Type of Member Functions, Inline Functions, Friend function, Namespace, Static and Const Keyword, Constructors, Parameterized Constructors, Copy Constructors, Dynamic Constructors, Destructors

Unit III   **[Weightage=25% approx., Lectures=8, Practicals= 16]**

Inheritance: Introduction, Defining Derived Classes, Types of Inheritance (Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance),Order of Constructor call in inheritance, Virtual Base Class, Abstract Class,

Unit-IV   **[Weightage=25% approx., Lectures=8, Practicals= 14]**

Polymorphism: Function Overloading, Operator Overloading Introduction, Overloading Unary and Binary Operator, Overloading Using Friend Function, String Manipulation using Operator Overloading, This Pointer, Pointers to Objects, Pointer to Derived Classes. Virtual Functions and Pure Virtual Functions

Exception handling

Text Books:

- E.Balaguruswamy, Object Oriented Programming in C++

References

- Schaums Outline series, *Programming in C++*
- Venugopal, Rajkumar, Ravishankar, *Mastering C++*, Mc Graw Hill
- Stroustrup, Bjarne, *The C++ Programming Language* , Addison Wesley
- Robert Lafore, *Object Oriented Programming in C++*, McGraw Hill

Practical List:

- Programs based on input and output.
- Programs on Iterations, Control structures.
- Examples of function overloading.
- Examples of types of constructors, destructor.
- Programs based on types of Inheritance.
- Examples of Virtual functions and dynamic polymorphism.
- Programs of operator overloading.
- Programs which perform exception handling.

Subject Title	:	**Data Structures and Algorithms**
Subject Code	:	**CSM204-1C**
Subject Type	:	**Major**

Rationale:

Introduce students to the concept, role and importance of data structure. To identify the key differences between various data structures and operations on data structures.

Learning Outcomes:

After studying this subject

- Implement various operations of data structures.
- Use of data structures for real applications.

Teaching and Evaluation Scheme:

Credit	Duration in Hours		Maximum Marks		
	Theory	**Practical**	**CCE (Formative)**	**SEE (Summative)**	**Total**
4 (2+2)	30	60	50	50	100

Course Content

Unit I   **[Weightage=25% approx., Lectures=7, Practicals= 14]**

Programming Concepts: Introduction to Data structure and its classification (Primitive, non- Primitive: linear-nonlinear), Basic Terminology, Data Structure Operations;

Arrays: Introduction, Linear Arrays, Representation of Linear Arrays in Memory, traversing Linear Arrays, Insertion, Deletion and Merging in Linear Arrays; Multidimensional Arrays; Matrices, Sparse Matrices, Pointer Arrays, Application of Arrays.

Unit II   **[Weightage=25% approx., Lectures=8, Practicals= 16]**

Stacks: Properties of stack, Stack Representation using Array, Stack Operations (PUSH, POP, PEEP); Implementation of Stacks. Application of Stacks-Evaluating Arithmetic Expression using Stacks -Infix to Postfix Notation. -Evaluating a Postfix Notation-

Queues: Properties of Queue, Implementation of Queue, Circular Queue, Priority Queue, Double Ended queue, Queue representation using Array, Queue operations (Insert, Delete), Application of Queues.

Unit III   **[Weightage=25% approx., Lectures=8, Practicals= 16]**

Linked List: Introduction, Representation of Linked List, singly linked list, doubly linked list, Circular linked list, Operations of linked list (Insertion, Deletion, Traversal).

Graphs and Trees: Definition and concepts of trees, Representation of Binary tree, Traversals operations of

Binary search tree, Graph Terminologies, Representation of Graphs.

Unit IV   **[Weightage=25% approx., Lectures=7, Practicals= 14]**

Sorting and Searching : Sorting Techniques: Bubble sort, Selection Sort, Insertion Sort, Merge Sort.
Searching Techniques: Linear search, Binary search.

Text Books:

- Classic Data Structures by Samanta,Debasis

References:

- Schaum's Outline Series: Theory and Problems of Data Structures-Seymour Lipschutz

- Introduction to data structures with application-Jean-Paul Tremblay &G.Sorenson

- Data structures using c and C++, Tanenbaum

Practical List:

- Write a program to insert, delete, search, and traverse of 1D array

- Write a program to implement stack operations

- Write a program to implement Simple Queue operations.

- Write a program to implement Circular Queue operations.

- Write a program to demonstrate various data structure operations (insert, delete, traverse) on Singular linked list.

- Write a program to demonstrate various data structure operations (insert, delete, traverse) on Singular circular linked list.

- Write a program to implement linear search.

- Write a program to implement Binary Search.

- Write a Program for bubble sort

- Write a Program for selection sort.

- Write a program to implement Insertion sort.

B.Sc. (CS) Semester – II (First Year)

Subject Title   :   **Operations Research**
Subject Code   :   **CSE202-1C**
Subject Type   :   **Minor**

Rationale:

This course provides strong foundation for understanding the fundamental principles and laws of Operation Research to understand Linear programming, network Analysis and queuing, replacement models. Students can understand and solve the problems regarding management and application of various models.

Learning Outcomes:

- Trace the origin and development of operations research
- Understand the various types of models in operations research and their advantages
- Describe the methodology of operations research
- Understand the role of decision-making in operations research
- Describe the application, use and limitations of operations research

Teaching and Evaluation Scheme:

Credit	Duration in Hours		Maximum Marks		
	Theory	**Practical**	**CCE (Formative)**	**SEE (Summative)**	**Total**
4	60	-	50	50	100

Course Content

Unit I   **[Weightage=25% approx., Lectures=15]**

Introduction to Operation Research (OR) Origin and Development of OR, nature of OR, characteristics, of OR, classification of problems in OR, MODELS IN OR, phases of OR, uses and limitations of OR, methodologies in OR, APPLICATIONS IN OR.

Unit II   **[Weightage=25% approx., Lectures=15]**

Linear programming - concept of linear programming model, mathematical formulation of the problem, graphical solution methods linear programming methods - simplex method.

Unit III   **[Weightage=25% approx., Lectures=15]**

Transportation problem: Mathematical models for transportation problem, types. Assignment problem-Hungarian method.

Unit IV   **[Weightage=25% approx., Lectures=15]**

Decision Theory: Introduction, decision under certainty decision under risk, decision under uncertainty, decision tree Network Scheduling by CPM/PERT - Introduction, basic concept, constraints in network, critical path method (CPM), PERT network, PERT calculations. Advantages of network (PERT/CPM).

Text Books:

- Operation Research and Application by J.K. Sharma.

- Quantitative Techniques in management, N.D. Vora – Tata McGraw Hill

Reference Books:

- Principles of Operations Research: With Applications to Management Decisions, Wagner, H.M. , Prentice-Hall of India, New Delhi, 1982.

- Hillier, F.S. and Lieberman, G.J., Operations Research, Holden Day Inc., San Francisco, 1974.

- Littlechild, S.C. (ed), Operational Research for Managers, Philip Allan, Oxford, 1977.

- Mitchell, G.H. (ed), Operational Research Techniques and examples, The English Universities Press Ltd., London, 1972. Moder, J.J. and Elmaghraby, S.E. (ed.), Handbook of Operations Research: Models and Applications, Van Nostrand Reinhold Co., New York, 1987.

- Payne, T. A., Quantitative Techniques for Management: A Practical Approach, Reston Publishing Co.Inc., Virginia, 1982. Wilkes, F.M., Baum, P. and Smith, G.D., Management Science: An introduction, John Wiley and Sons, Santa Barbara, 1979

B.Sc. (CS) Semester – II (First Year)

Subject Title   :   **Discrete Mathematics**
Subject Code   :   **MDC242-1C**
Subject Type   :   **MDC**

Rationale:

The objective of this course is to present the foundations of many basic computer related concepts and provide a coherent development to the students for the courses like Fundamentals of Computer Organization, RDBMS, Data Structures, Analysis of Algorithms, Theory of computation, Cryptography, Artificial Intelligence and others.

Learning Outcomes:

This course will enhance the student's ability to think logically and mathematically.

Teaching and Evaluation Scheme:

Credit	Duration in Hours		Maximum Marks		
	Theory	**Practical**	**CCE (Formative)**	**SEE (Summative)**	**Total**
4	60	-	50	50	100

Course Content

Unit I   **[Weightage=25% approx., Lectures=15]**

Mathematical Logic: Introduction, Connectives, statement formulas, principle of substitution, validity of arguments, Quantifiers, Proof techniques.

Unit - II   **[Weightage=25% approx., Lectures=15]**

Lattices and Boolean Algebra: Relation and ordering, partially ordered sets, lattices as poset, properties of lattices, Lattices as algebraic systems, sublattices, direct product and homomorphism, complete lattices, bounds of lattices, distributive lattice, complemented lattices.

Introduction, definition and important properties of Boolean Algebra, Sub Boolean algebra, direct product and homomorphism, join-irreducible, meet-irreducible, atoms, anti-atoms, Stone's representation theorem. (Without Proof), Note: No proof is required for Theorems or Results on lattices and Boolean Algebra. Theorems should be justified and explained by suitable examples.

Unit III   **[Weightage=25% approx., Lectures=15]**

Applications of Boolean Algebra: Boolean expressions and their equivalence, Minterms and Maxterms, Free Boolean algebra, Values of Boolean expression, canonical forms, Boolean functions, representation of Boolean function, Karnaugh maps, minimization of Boolean function

Unit IV   **[Weightage=25% approx., Lectures=15]**

Group Theory: Definition and examples of groups, abelian group, cyclic groups, permutation groups, subgroups & Homomorphism,

Graph Theory: Basic concepts of Graph theory, paths, matrix representation of graph, trees.

Text Books:

- Digital Fundamentals – Eighth edition – Floyd and Jain – Pearson education
- "Discrete Mathematical Structures with Applications to Computer Science", J. P. Tremblay and R.Manohar ,Tata McGraw-Hill
- "Discrete Mathematical Structure", D. S. Malik, M. K. Sen, Cengage Learning Suggested
- Discrete Mathematics and its applications, Tata McGraw-Hill, 6th edition, K. H. Rosen.
- Discrete Mathematical Structure, Pearson Education, Bernard Kolmann& others, Sixth Edition
- Discrete Mathematics with Graph Theory, PHI, Edgar G. Goodaire, Michael M. Parmenter.
- Logic and Discrete Mathematics, Pearson Education, J. P. Tremblay and W. K. Grassman.

B.Sc. (CS) Semester – II (First Year)

Subject Title   :   **Communication Skills**
Subject Code   :   **AEC204-1C**
Subject Type   :   **AEC**

Learning Outcomes:

- Basic concepts of the communication process.

- Elements enhancing effective communication.

- Various skills involved during communication.

- Oral and written communication in practice.

Teaching and Evaluation Scheme:

Credit	Duration in Hours		Maximum Marks		
	Theory	**Practical**	**CCE (Formative)**	**SEE (Summative)**	**Total**
2	30	-	25	25	50

Course Content

Unit I   **[Weightage=30% approx., Lectures=07]**

Fundamentals of Communication

Meaning of communication, Process of communication, Seven C's of communication

Barriers to effective communication: interpersonal, intrapersonal and organizational barriers

Listening: difference between hearing and listening, importance of listening in communication, reasons for poor listening, active VS passive listening, types and barriers to listening

Unit II   **[Weightage=30% approx., Lectures=11]**

Types of Communication

Verbal communication: oral and written communication, its advantages and disadvantages

Forms of non-verbal communication: kinesics, proxemics, chronemics and paralanguage

Speaking skills: telephonic skills, do's and don'ts of telephonic skills, etiquettes.

Conversations: purposes of general conversation, features of a good conversation, tips for improvement, 3 samples and points to observe

Reading comprehension: Purpose, reasons for poor comprehension, ways to improve them, techniques for good comprehension

Unit III   **[Weightage=40% approx., Lectures=12]**

Professional Communication in Practice

Presentation skills: Defining Purpose, analyzing audience and locale, organizing content, preparing outline, visual aids, mode of delivery, body language

Group discussion: organizational (three techniques) as a part of selection process (Characteristics, evaluation components, tips)

Email writing: reasons for popularity, common pitfalls, guiding principles, common etiquettes

Meetings: purpose, preparation, notices, agenda and minutes

Reference Books

- Business Communication, Meenakshi Raman& Sangeeta Sharma, Oxford University Press Publication
- Effective Technical Communication By: M Ashraf Rizvi, MC Graw Hall Publication
- Communicative English by Prakash Khuman, Bhupesh Gupta (Books India Publications)
- Communication Skills By: Sanjay Kumar and Pushpa Lata, Oxford University Press Publication

B.Sc. (CS) Semester – II (First Year)

Subject Title : **Project- II**
Subject Code : **SEC242-1C**
Subject Type : **SEC**

Rationale:

By studying the different theoretical and fundamental concept of object oriented, students must ensure their learning by developing real time or scenario-based applications. The project development as a subject will help them to learn and understand the real time applications of the concept.

- Primarily, student must gain the knowledge about the applications of the fundamentals.
- Importantly, they need to also learn the technology trends and develop their skills on those technologies during project development.

Learning Outcomes:

- Students will be able to learn and perform object-oriented programming applications using C/C++.

Teaching and Evaluation Scheme:

Credit	Duration in Hours		Maximum Marks		
	Theory	Practical	CCE (Formative)	SEE (Summative)	Total
2	-	60	25	25	50

Content:

Students with specific count of members will select a Project Title related to real life application development using C / C++ or any other programming language. They may applications for solving problems related to Data Structures, File Management, implementing OOP concepts.

Project report shall be submitted including following details:

- Project Title
- Group Details
- Project Domain
- Project Definition
- Project Overview
- Detail Explanation
- Future Enhancement
- References

Note: Project will be evaluated based on Presentation / Live Project Demonstration.

B.Sc. (CS) Semester – II (First Year)

Subject Title   :   **Environmental Studies**
Subject Code   :   **VAC201-1C**
Subject Type   :   **VAC**

Rationale:

To focus on Environmental Science that is an interdisciplinary subject which appeals on the content of several disciplines to offer a balanced scientific and holistic perspective of environmental issues. It will

provide knowledge, skills, and attitudes to identify, prevent, and solve environmental problems and thereby prepares students for ultimate careers in diverse fields of relevance to environmental management and to sustainable development of the nation.

Learning Outcomes:

Students will be able to:

- Stimulate interest in the Environment.

- Understand the interdisciplinary and holistic nature of the environment.

- Develop knowledge and understanding of Environmental issues and principles and the ability to apply Environmental Management.

- Provide an understanding of interactions between people and the Environment.

- Increase an awareness of the importance of living in harmony with the Environment.

- Develop an understanding of how natural resources and the environment affect the quality of life and the quest for sustainable development of the nation.

Teaching and Evaluation Scheme:

Credit	Duration in Hours		Maximum Marks		
	Theory	**Practical**	**CCE (Formative)**	**SEE (Summative)**	**Total**
2	30	-	25	25	50

Course Content:

   Unit I   **[Weightage=50% approx., Lectures=15]**

   Ecology and Environment: Definition, scope, and basic principles of ecology and environment, Natural Resources – Renewable and Non-renewable resources, Current Environmental issues- climate change, Global warming, Acid rain, Ozone layer depletion, Pollution - Air, Water, Soil, Marine, Thermal, Noise pollution - causes and effects.

Unit II   **[Weightage=50% approx., Lectures=15]**

Ecosystem: Basic concepts, components of the Ecosystem, Trophic levels, food chains and food web, Ecological pyramids, ecosystem functions, Energy flow in ecological systems, energy efficiencies.

Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus, Hydrogen, and Sulphur Cycles.

Reference Book:

- Basics of Environmental Studies, 4th Edition, B. R. Shah, Snehal Popli, Mahajan Publishing House.