SEMESTER II

Branch: B.Sc.(IT)	Semester-II
Subject Code: 2101	Lecture: 02 Credit: 02
Course Opted	Ability Enhancement Compulsory Course-II
Subject Title	Environmental Science

Course Objectives:
- To help the students to acquire knowledge of pollution and environmental degradation.
- To help students acquire knowledge of the environment beyond the immediate environment including distant environment.
- To help students acquire a set of values for environmental protection.
- To provide students with an opportunity to be actively involved at all levels in environmental decision making.

Course Outcomes:
Students will learn to
- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Module	Sr. No.	Topic and Details	No. of Lectures Assigned
Unit I	1.	**The Multidisciplinary nature of environmental studies** Definition, scope and importance Need for public awareness.	2
Unit II	1.	**Natural Resources** • Renewable and non-renewable resources: • Natural resources and associated problems. a) Forest Resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, and salinity.	8

		e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.	
		f) Land resources: Land as a resources, land degradation, man-induced landslides, soil erosion and desertification.	
		g) Role of an individual in conservation of natural resources. - Equitable use of resources for sustainable lifestyles.	
Unit III	1.	**Ecosystem** ☐ Concept of an ecosystem. ☐ Structure and function of an ecosystem. • Energy flow in the ecosystem. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristics 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)	6
Unit IV	1.	**Environmental Pollution** Definition, Causes, effects and control measures of : a. Air pollution b. Water pollution c. Soil pollution d. Noise pollution e. Thermal pollution f. Nuclear hazards	6
	2.	• Solid waste Management: Causes, effects and control measures of urban and industrial wastes – biodegradable and non biodegradable wastes. ☐ Role of an individual in prevention of pollution. ☐ Disaster Management: Floods, earthquake, cyclone and landslides	3
		Total	**25**

Recommended Readings:

1. Rajagopalan, R. 2018 Environmental Studies- From Crisis To Cure, Oxford University Press, New Delhi.

2. Agarwal, K.C. 2001 Environmental Biology, Nidi publ. Ltd. Bikaner.

3. Bharucha Erach, Text book on Environmental Studies, UGC, New Delhi, 2017

4. Borua P.K., J.N.Sarma and others, A Text book on Environmental Studies, Banlata, Dibrugarh, 1989

5. Brunner R.C., 1989 Hazardous Waste Incineration, McGraw Hill Inc. 480p.

6. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB), 2001

7. J. P. Sharma 2013. Environmental Studies. University Science Press, New Delhi.

8. Jadav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.

9. Joshi P.C. and Namita Joshi, A Text book of Ecology and Environment, Himalaya Publishing, 2009

Branch: B.Sc(IT)	Semester-II
Subject Code: 2102	Lecture: 04
	Credit: 04
Course Opted	Core Course -4
Subject Title	PROGRAMMING METHODOLOGY AND C++

Course Objectives:
- To understand how C++ improves C with object-oriented features.
- To learn how to design C++ classes for code reuse.
- To learn how to implement copy constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload functions and operators in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to design and implement generic classes with C++ templates.

Course Outcomes:
- Students will be able to
- Describe the object-oriented programming approach in connection with C++
- Apply the concepts of object oriented programming
- Analyze a problem and construct a C++ program that solves it
- Discover errors in a C++ program and describe how to fix them
- Illustrate the process of data file manipulations using C++

Modules	Sr. No.	Topic and Details	No. of **Lectures** Assigned	Marks Weightage %
Unit- I	1	**INTRODUCTION**: MODELING CONCEPTS, CLASS MODELING: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development **Evolution of OOP:** Advantages and disadvantages of OOP over its predecessor paradigms. Characteristics of Object Oriented Programming: Abstraction, Encapsulation, Data hiding, Inheritance, Polymorphism, Code Extensibility and Reusability, User defined Data Types. • C++ProgramStructure • Simple Input/OutputProgram • Program Comments • Identifiers • Literals • String, Character, Integer,Floating Point, Constants • Keywords	5	10

		• DataTypes		
		Operators in C++		
		Control Structures in C++		
	2	**Advanced Language Constructs**	3	6
		• Arrays		
		• Multi dimensional arrays		
		• Pointers		
		• Structures		
Unit- II	3	**Object and Classes :**	4	8
		• Core object concepts		
		• Encapsulation, Abstraction, Polymorphism		
		• Classes, Messages Association, Interfaces		
		• Implementation of class in C++,		
		• C++ Objects as physical object,		
		• C++ object as data types constructor.		
		• Object as function arguments.		
		Functions and Variables		
		• Functions: Declaration and Definition		
		• Variables: Definition, Declaration, and Scope		
		• Dynamic Creation and Derived Data		
		• Arrays and Strings in C++		
	4	**Inheritance**	6	12
		• Concept of inheritance		
		• Derived class and based class		
		• Types of inheritance		
		• Classes within classes		
		• Functions and Friend Functions		
		Constructors		
		• Multiple Constructors and Initialization		
		• Using Destructors to Destroy Instances		
Unit- III	5	**Polymorphism**	8	16
		• Syntax for Operator overloading		
		• Overloading unary operations.		
		• Overloading binary operators		
		• Data conversion		
		• Pitfalls of operators overloading and conversion keywords.		
	6	**Memory management**	8	16
		• New and Delete		
		• Pointers to objects		
		• Debugging pointers.		

Unit- IV	7	**Files and streams** • iostream hierarchy • Standard Input/output Stream Library • Programming using Streams, Basic Stream Concepts. **File input and output:** • Reading a File • Managing I/O Streams • Opening a File – Different Methods • Checking for Failure with File Commands • Checking the I/O Status Flags • Dealing with Binary Files	8	16
	8	**Class templates:** • Implementing a class template • Implementing class template member functions • Using a class template • Function templates • Class template specialization • Template parameters, Static members and variables **Exception Handling:** • try • throw and • catch constructs • rethrowing an exception • Catch all Handlers.	8	16
		TOTAL	50	100

Text Books:
1. E. Balguruswamy, 'Object Oriented Programming with C++', Tata McGraw – Hill Education, 2008
2. K.R Venugopal 'Mastering C++', Tata McGraw-Hill Education, 1997
References:
1. B.Stroustroup 'C++ Programming Language' (3rd Edition). Addison Wesley, 1997
2. B.chandraNarosa 'A Treatise On Object Oriented programming using C++'- Publications, 1998
3. Herbert Schildt, "The Complete Reference CN", Tata McGraw-Hili, 2001

Branch: B.Sc(IT)	Semester-II
Subject Code: 2201	Lecture: 02 Credit: 02
Course Opted	Core Course -4 Practical
Subject Title	PROGRAMMING METHODOLOGY AND C++ LAB

Course Objectives:

• Will enable students to

- Identify and practice the object-oriented programming concepts and techniques
- Practice the use of C++ classes and class libraries, arrays, vectors, inheritance and file I/O stream concepts.
- **Course Outcomes**:

Students will be able to:
- Create simple programs using classes and objects in C++.
- Implement Object Oriented Programming Concepts in C++.
- Develop applications using stream I/O and file I/O.
- Implement simple graphical user interfaces.
- Implement Object Oriented Programs using templates and exceptional handling

Modules	Sr. No.	Topic and Details	No. of **Lectures** Assigned	Marks Weightage %
Unit- I	1	**Evolution of OOP**: Simple Programs on fundamental Data Types and I/O operators, Derived data types, Symbolic constants, variables and Reference variables **Operators and decision control structures**: Programs to implement if statements, Switch statements, Loop statements, Functions in C++: Main function, function proto type, Call by reference, return by reference, Inline functions, Default arguments, Const Arguments, Function overloading,	3	6
	2	**Advanced Language Constructs:** Programs on Arrays, Multi dimensional arrays, pointers and structures.	2	4
Unit- II	3	**Objects and Classes:** Classes and Object, Programs for memory allocation for objects, Arrays of objects, Returning objects, Const Member functions, Pointers to members. **Functions and Variables:** Programs to implement Defining a function, declaration and calling a function, function arguments, Default values for parameters, friend function, Dynamic creation and derived data and use of arrays and strings with functions.	2	6
	4	**Inheritance :** Programs for Inheritance Single, Multiple, Multilevel, Hierarchical inheritance, Hybrid inheritance, Virtual base class, Abstract class, Constructors in derived classes, Nesting of classes. **Constructors and Destructors :** Implementations of Constructors(Parameterized	4	8

		Constructors, Multiple constructors in a class, Constructors with default arguments, Copy constructors, Dynamic constructors)Destructors		
Unit- III	5	**Polymorphism:** Programs for Operator Overloading (Unary, Binary, Using friend functions etc.)	2	5
	6	**Memory Management :** Programs on memory management using new and delete and pointers to objects	2	5
Unit- IV	7	**Files and Streams :** Programs for Managing Console I/O OPERATIONS and Working with files: C++ Stream and Classes, Unformatted I/O operations, Put(),get(), getline(),write(), Formatted console I/O operations, Ios class functions and flags, Manipulators, User defined output functions. **File input and output**: Implementation of Opening and closing files, Detecting End of file, File modes, File pointers and their manipulations, Sequential input and output operations, Reading and writing class object, Command line arguments.	5	8
	8	**Templates:** Implementations of Class template, Class template with multiple parameters, Function template. **Exception Handling:** Implementations of try, catch and throw statement for handling the exceptions.	5	8
		TOTAL	**25**	**50**

Text Books:
1. E. Balguruswamy, 'Object Oriented Programming with C++', Tata McGraw – Hill Education,2008
2. K.R Venugopal 'Mastering C++', Tata McGraw-Hill Education, 1997

Branch: B.Sc.(IT)	Semester-II
Subject Code: 2103	Lecture: 04
	Credit: 04
Course Opted	Core Course- 5(Theory)
Subject Title	Data Structures using 'C'

Module	Sr.. No.	Topic and Details	No of Lectures Assigned	Marks Weight age %
UNIT-I	1	Introduction to data structure, Classification of data structure, Operations performed on data structures	4	20
	2	Algorithm Analysis • Algorithm Characteristics, Space complexity, Time complexity. • Asymptotic notation(Big O, 0, Omega and Theta	6	
	3	Arrays • Linear data structure, arrays, operations on an array,two dimensional arrays, multi dimensional arrays. • Searching, Sequential and binary search. • Sorting, bubble sort, insertion sort, selection sort	8	16
UNIT-II	4	Linked Lists • Linked list, static representation, dynamic representation • Circular linked list, Insertion and deletion operations • doubly linked list,	6	12
	6	Stacks • Stacks representation, static and dynamic operation, • Polish Notation, Postfix expression evaluation, Conversion into other notations , recursive function	5	10
UNIT-III	7	Queue • Queue representation static and dynamic, operation, • Circular queue, Deque, Priority queues.	5	10
	8	Trees • Trees, Binary tree ,Traversal (Inorder,Preorder,Postorder), Memory representation • Binary search tree, • Heap,Heap sort, height balanced trees—AVL trees	6	12

UNIT-IV	9	Graphs,
		  • Representation, adjacency matrix, adjacency list, adjacency multi –list,
		  • Depth first search,
		  • Breadth first search
		  • Minimum spanning tree
			6	12

	10	Hash tables, hashing and collision resolution techniques	4	8
Total			50	100%

Text Book: Data Structure by Lipshutz ,Schaum's Outline, MCGRAW-HILL, 1986
References:
- Fundamentals ofData Structure - Horowitz and Sahani, 2004
- Data Structure in C – Tanenbaum, 2003
- Fundamentals of computer algorithms – Horowitz and Sahani. 2nd Edition, 2008
- Classic Data Structure - D. Samanta, PHI publication, 2nd Edition, 2009
- Data management and File Structure - Mary E.S. Loomis. PHI, 1990

Branch: B.Sc(IT)	Semester-II
Subject Code: 2202	Lecture: 02
	Credit: 02
Course Opted	Core Course -5 Practical
Subject Title	Data Structures using 'C' LAB

Course Objectives:

- To introduce the concepts of data structures including arrays, linked list, stack and queues.
- To design and implement various data structure algorithms.
- To introduce various techniques for representation of the data in the world.
- To create programs using data structure algorithms and also techniques of sorting and searching.

Course Outcomes:

- Select appropriate data structures as applied to specified problem definition.
- Implement operations like traversing, insertion, deletion and searching etc. on various data structures.
- Students will be able to implement linear and non - linear data structures.
- Implement appropriate sorting and searching techniques for given problems.

Modules	Sr.No.	Topic and Details	No. of Lectures/Practicals Assigned	Marks Weightage %
UNIT-I	1	**Arrays:** Implementations of Array and Operations- Insertion, deletion of an element from one dimensional array, Traversing of array	2	4
UNIT II	2	**Linked Lists: Singular** Implementation of List and Linked List and Operations- Inserting, Deleting of nodes etc	2	4
	4	**Stack:** Stack Implementation, Operations on stack(Push Pop). Implementation of stack using pointer,	4	8
UNIT-III	5	**Queue:** Implementation of Queue Implementation, Operations on queue(Insertion and deletion)	3	6
	6	**Trees:** Implementation of tree as Array and Linked lists and Traversal (Inorder, Preorder, Postorder)	4	8

UNIT-IV	7	**Graphs:** Implementation of Graph traversal (BFS, DFS Shortest path)	3	6
	8	**Searching & Sorting:** Implementation of searching (Sequential, Binary search) Sorting (Bubble sort, Selection sort, Insertion Sort.)	**4**	**8**
		Total	**25**	**50**

Branch: B.Sc.(IT)	Semester-II
Subject Code: 2104	Lecture: 04
	Credit: 04
Course Opted	Core Course- 6
Subject Title	Mathematics II

Course Objective:

The subject aims to provide the student with:

- Mathematics fundamental necessary to formulate, solve and analyze computer science problems.
- An understanding of Fourier Series and Laplace Transform to solve real world problems.
- An understanding of numerical methods.
- An understanding of Complex integration.

Course Outcomes:

The student will be able to

- Analyze and solve computer science problems
- Understand the applications of Fourier Series and Laplace Transform to solve real world problems
- Apply numerical methods to find solutions of algebraic equations using different methods viz. Bisection method, Regula - Falsi, Newton Raphson's, Ramanujan's method, Matrix Inversion and Gauss Elimination
- Understand Complex Integration

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weight age %
UNIT-I	1	**Vectors** Vectors in two and three dimensions, Vector algebra, Vector function in two and three variables, Vector differentiations, Gradient Divergence and curl, Double and triple integral	12	24
UNIT-II	2	**Fourier series** Definition, Fourier coefficient ,Determination of Fourier series of simple function, Fourier series of even and odd Function	10	20
UNIT-III	3	**Laplace transform** Laplace transform of simple functions, Inverse Laplace transform, application of Laplace transform	10	20
UNIT-IV	4	**Complex Numbers** Complex Numbers and The Complex Plane, Cartesian Polar and Exponential form, Argand's diagram , De Movier's theorem, Function of a complex Variable,	8	16

		Complex integration, Simple example		
	5	**Numerical Methods** **Roots of non-linear equations** a)Bisection Method b)Regula-falsi Method c)Newton-Raphson Method **Direct solution of linear equation** a) Matrix Inversion, b) Gauss-Elimination Method	10	20
Total			50	100

Course Outcomes:
On completion of the course students will be able to

- Solve vectors related problems in computer science domain.
- Solve the problems using Laplace transforms.
- Analyze and solve the problems using Fourier Series.
- Identify and Solve problems using Complex Integration.
- Understand numerical techniques to find the roots of nonlinear equations and solution of system of linear equations.

Text & Reference Books:
- Murray Spiegal, "Vector Analysis", McGraw Hill, 1974.
- P. N. Wartikar & J. N. Wartikar, "Elements of Applied Mathematics", 7th, Pune Vidyarthi Graha, 1988,
- Mathematical methods for Engineer and Science Students by Engle field. Schaun Series, Vector Analysis, Spigel, 2009
- E. Balaguruswamy, Numerical Methods - Tata McGraw Hill Publication
- Grewal. B.S, "Higher Engineering Mathematics", 41 st Edition, Khanna Publications, Delhi, 2011.
- Dass, H.K., and Er. Rajnish Verma," Higher Engineering Mathematics", S. Chand Private Ltd., 2011.
- S.S. Shastri "Introductory methods of numerical analysis" Vol-2, PHI, SECOND edition, 1994

Branch: B.Sc.(IT)	Semester-II
Subject Code: 2105	Lecture: 02
	Credit: 02
Course Opted	Skill Enhancement Course - 2
Subject Title	Technical Writing

Course Objectives
- To emphasis need and importance of Technical Communication
- To acquaint with process of Technical Writing
- To introduce various user guides
- To introduce the concept of Translation and Localisation
- To understand the importance of working environment

Course Outcomes
- Understand the process of Technical Writing
- Understand Various User Guides
- Aware about the concepts of Translation and Localization
- Aware about the Working environment required for technical writing
- Writing Project Proposal, Software Project Documentation and Report writing

Module	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weightage
Unit I	1.	Technical Communication • Definition of Technical Communication • Need for Technical Communication • Importance of Technical Communication • Attributes of Technical Communication	2	4
	2.	Role of Technical Author	1	2
	3.	Process of Technical Writing	1	2
Unit II	2.	Technical Publications User guides • Administering guides • Deployment guides • Installation guides • Implementation guides • Troubleshooting guides	3	6
Unit III	5.	Technical Leaflets • Objectives • Components of Technical Leaflets • Preparing Technical Leaflets	2	4
Unit IV	6.	Technical Specifications & Descriptions • Requirement Specifications • Functional Specifications • Design Specifications • Test Specifications • Writing Technical Descriptions • Writing Processes and Procedures	3	6

Unit V	7.	Development Models • Waterfall • Agile	1	2
	8.	Translation and Localization • Fundamental Concepts	2	4
	9.	Working environment • Working with SMEs • Working in global audience • Telephone etiquettes	2	4
	10.	Technical Summaries • Types of Technical Summaries • Importance of Summaries • Format of writing Summaries	2	4
	11.	Project Proposals • Objectives • Types of Proposal • Parts of Proposal • Writing the Proposal	2	4
	12.	Software Project Documentation • Proposal • System Specifications • User Manual	2	4
	13.	Reports Making and Note Making	2	4
		TOTAL	**25**	**50**

Recommended Readings:

1. Technical Writing – Process and Product by Sharon T. Gerson & Steven M. Gerson, Pearson Education Inc.
2. Technical Writing and Profession by Thomas N. Huckin & Leslie A. Olsen, Macmillan
3. Writing and Life by Don Knefel, CBS College Publishing
4. Business Correspondence and Report Writing by R.C. Sharma & Krishna Mohan 3rd Edition Tata McGraw-Hill
5. Beginner's Guide to Technical Writing by John Evans
6. Thirty Minutes before presentation by Patrick Forsyth, Kogan Page India Pvt Ltd.
7. Writing and Analyzing effective Computer System Documentation by Ann Stuart , University of Evansville, Indiana
8. How to write a Computer Manual -A Handbook of Software Documentation by Jonathan Price, The Benjamin-Cummings Publishing Company, California
9. Technical Documentation by A. J. Marlow, NCC Blackwell
10. The Elements of Style by William Strunk Jr.
11. Technical Writing for Dummies by Sheryl Lindsell-Roberts
12. Technical Communication, 9th edition by Mike Markel
13. The Insider's Guide to Technical Writing by Krista Van Laan
14. Technical Writer Career Guide by ClickHelp
15. Microsoft Manual of Style