Object Oriented Programming using C++ (23B51CS121)

Principles of Objective Oriented Programming, Token Expressions & Control Structures, Functions in C++, Classes & Objects, Constructors & Destructors, Operator Overloading, Inheritance, Pointers, Virtual Functions & Polymorphism, Exception handling, Working with Files

Course Description

Course Code	23B51CS121	**Semester: Even**	**Semester: II Session 2022-2023 Month from: Jan-June 2023**	
Course Name	Object Oriented Programming using C++			
Credits	**3**	**Contact Hours**	**3-0-0**	
Faculty (Names)	**Coordinator(s)**			
	Teacher(s) (Alphabetically)			

COURSE OUTCOMES After pursuing the course, the students will be able to		**COGNITIVE LEVELS**
CO1	explain the fundamental principles of object-oriented programming.	Understand Level (Level 2)
CO2	analyze the output of the source code and able to debug the errors.	Analyze Level (Level 4)
CO3	construct the class diagram for real life problems and implement it using virtual functions, abstract classes.	Apply Level (Level 3)
CO4	make use of exception handling in C++.	Apply Level (Level 3)
CO5	demonstrate and apply various operations like traverse, insertion, deletion, etc. on files.	Apply Level (Level 3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures**
1.	Principles of Objective Oriented Programming	Object Oriented Programming Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of Object-Oriented Programming, Object Oriented Languages, Applications of Object-Oriented Programming, Beginning with C++.	**5**
2.	Token Expressions & Control Structures	Tokens, Keywords, Identifiers and Constants, Data Types, Type Compatibility, Variables, Operators in C++, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.	**5**
3.	Classes & Objects, Functions in C++	Objects, Classes, Internal representations of Objects, The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Function Overloading, Friend and Virtual Functions.	**12**

		Specifying a class, Member Functions, Arrays within a class, Static Member Functions, Arrays of Objects, Friendly Functions.	
4.	Constructors & Destructors, Operator Overloading, Inheritance	Constructors, Parameterized Constructors, Copy Constructors, Dynamic Constructors, Destructors, Defining Operator Overloading, Overloading Operators, Rules for Overloading Operators, Type Conversions.	**8**
5.	Pointers, Virtual Functions & Polymorphism,	Pointers, Pointers to Objects, this pointer, Pointer to Derived Classes, Virtual Functions	**7**
6.	Exception handling, Working with Files	Exceptions, Try, Catch and Throw, Re-throwing exceptions, Classes for File Stream Operations, Opening and Closing a File, File Modes, File Pointers, Input Output Operations, Updating a File.	**5**
		Total Number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments)
Total	**100**

Project based learning: Each student in a group of 3-4 will have to develop a mini project based on object-oriented programming concepts. The students have to design the class diagram for any real-world application. The students have to implement the mini project using C++language. Project development and its presentation will enhance the knowledge and employability of the students in IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc)

Text Books

1	**Schildt H.**, C++: The Complete Reference, McGraw-Hill Osborne Media, 4th Edition, 2017
2	**Lafore R.,** Object-Oriented Programming in C++. Sams Publishing, 4th Edition, 2001.
3	**Balagurusamy E.**, Object-oriented programming with C++, TMH, 8th Edition, 2021.

CO-PO-PSO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO-CS**	**PSO-IT**	**PSO-CP**
CO1	2	2	2	2	1		2	1	1	3	3	3
CO2	3	3	3	2			1	1	2	3	3	3
CO3	3	3	3	2	1	1	2	2	2	3	3	3

CO4	3	3	3	2			1	1	2	3	3	3
CO5	3	3	3	2			1		1	3	3	3
Avg	3	3	3	2	1	1	2		2	3	3	3

Object Oriented Programming using C++ - LAB (23B51CS521)

Control structures in C++, Object oriented concepts like class, objects, constructors, destructors, function and operator overloading, etc. using C++, Inheritance Private/Public inheritance, Multiple Inheritance using C++, Polymorphism using C++, Exceptions in C++, File handling in C++.

Course Description

Course Code	**23B51CS521**	**Semester: Even**	**Semester: II Session: 2022-23** **Month from: Jan - June 2023**
Course Name	Object Oriented Programming using C++ - LAB		
Credits	**2**	**Contact Hours**	**0-0-2**

Faculty (Names)	**Coordinator(s)**	
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES After pursuing the course, the students will be able to		**COGNITIVE LEVELS**
CO1	develop programs in C++ to implement control structures.	Apply Level (Level 3)
CO2	develop programs in C++ to implement OOPs concepts related to objects, classes, constructor, destructor, and friend function.	Apply Level (Level 3)
CO3	develop programs in C++ using OOPs concept like encapsulation, inheritance, polymorphism and abstraction.	Apply Level (Level 3)
CO4	make use of exception handling in C++ programs.	Apply Level (Level 3)
CO5	develop program in C++ for file handling.	Apply Level (Level 3)

Module No.	**Title of the Module**	**List of Experiments**	**No. of Labs for the module**
1.	Control structures in C++	Develop C++ programs using conditional structure (if, if-else, nested if), and iterative control structure (do-while, while, for).	2

		Implement switch case statement.	
2.	Object oriented concepts using C++	Write output-based C++ programs to implement the concepts of Objects, Classes, encapsulation, Constructors, Destructors, Function and Operator Overloading, Static and Friend Functions.	3
3.	Inheritance using C++	Write programs in C++ to implement concepts of Base Class, Derived class, Method Overriding, Private and Public Inheritance, Multiple Inheritance.	2
4.	Polymorphism using C++	Write programs in C++ using Virtual Functions, Pure Virtual Functions, Abstract Classes, operator overriding.	2
5.	Exceptions in C++	Write programs in C++ using Exceptions, Try, Catch and Throw, Re-throwing exceptions, Exception and Inheritance,	2
6.	File handling in C++	File creation, Modes of File handling like read, write, update	1
		Total number of Labs	**12**

Evaluation Criteria

Components	**Maximum Marks**
Lab Test -1	20
Lab Test -2	20
Day to Day	60
(Evaluation 1- 15, Evaluation 2- 15, Mini Project- 15, Attendance- 15)	
Total	**100**

Project based leaning: Groups of 3-4 students will choose a project topic. They will use the concepts of OOP and/or database to execute their project. In a team, they will learn how to apply the concepts for problem solving in a meaningful way.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	**Schildt H.,** C++: The Complete Reference, McGraw-Hill Osborne Media, 4th Edition, 2017
2	**Elmasri R., Navathe S.B.,** Fundamentals of Database Systems, Pearson, 7th Edition, 2016
3	**Stroustrup B.**, The C++ Programming Language, Addison Wesley, 4th Edition, 2013
4	**Silberschatz A., Korth H. F., Sudarshan S.**, Database System Concepts, 6th Edition, McGraw-Hill, 2010.
5	**Lafore R.,** Object-Oriented Programming in C++. Sams Publishing, 4th Edition, 2001.
6	**Hubbard J.R.,** Schaum's Outline of Programming with C++, McGraw-Hill, 2nd

	Edition, 2000

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO-CS	PSO-IT	PSO-CP
CO1	3	3	2	2			1		1	3	3	3
CO2	3	3	3	2	1	1	2		2	3	3	3
CO3	3	3	3	3	1	1	2		2	3	3	3
CO4	3	3	3	2			1		2	3	3	3
CO5	3	3	3	2			1		2	3	3	3
Avg	3	3	3	3	1	1	2		2	3	3	3

Data Structures (23B21MA111)

Introduction to Algorithm and Data Structures, operations on Data Structures, Linear Data Structures, Linked Lists, Stacks, Queues, Nonlinear Data Structures, Tree, Binary Search Tree, Heaps, Sorting and Searching, Tree traversal, Hashing and its applications.

Course Description

Course Code	23B21MA111	**Semester** Even	**Semester II Session - 2022-23** **Month from** Jan - June 2023	
Course Name	Data Structures			
Credits	3	**Contact Hours**	3-0-0	
Faculty (Names)	**Coordinator(s)**			
	Teacher(s) (Alphabetically)			
COURSE OUTCOMES After pursuing this course, the students will be able to				**COGNITIVE LEVELS**
CO1	demonstrate familiarity with major data structures.			Understanding Level (C2)

CO2	explain and construct linear data structure.		Applying Level (C3)
CO3	apply the concepts of tree-based data structures and hashing in various practical problems.		Applying Level (C3)
CO4	apply data-structures algorithm in sorting of data, text compression and cryptography.		Applying Level (C3)
Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Algorithm and Data Structures	**Algorithms:** Definition, Properties, Performance Analysis-Space Complexity, Time Complexity, Asymptotic Notations. **Data structures:** Introduction, classification of Data Structures, Operations on data structures.	4
2.	Linked Lists	Traverse, Insert, Delete, operations on Singly linked lists, Circular linked lists, Doubly linked lists, Selection sort, Bubble sort, Insertion sort, Linear search, Binary search.	7
3.	Stacks	Implementation of stacks using Arrays and linked list, PUSH, POP operations, Evaluation of Infix, Postfix and Prefix Expressions.	5
4.	Queues	Implementation of Queues using Arrays and linked list, Insertion and deletion operations on Circular queues and Priority queues	5
5.	Trees	Array and Linked list Representation of Binary Trees, Properties of Binary Tree, Traversing a Binary Tree, Merge sort, Quick sort.	5
6.	Binary Search Trees	Traverse, search, Insert and Delete operations in Binary Search Tree, importance of balancing.	5
7.	Heaps	Heap Property, Max Heap, Min Heap, Heap Sort.	3
8.	Hashing	One way hashing functions and their properties, hashing as a search structure, hash table, uses of hash tables in text compression	6

		and cryptography.	
9.	Graphs	Definition, terminology, directed and undirected graphs, properties, connectivity in graphs, applications, implementation – adjacency matrix.	2
Total number of lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments)
Total	**100**

Project based learning: Students in small groups will be assigned the problem of searching and soring of data; design algorithms for information retrieval from tree or graph. They will prepare corresponding computer programs.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	**E. Horowitz, S. Sahni and D. Mehta,** Fundamentals of Data Structures in C++, 2nd Ed., University Press, 2016.
2.	**S. Sahni,** Data Structures, Algorithms, and Applications in C++, WCB/McGraw-Hill, 2005.
3.	**A. M. Tenenbaum,** Data Structures Using C, Pearson Ed, India, 1990.
4.	**N. Dale,** C++ Plus Data Structures, Jones & Bartlett Learning; 5th Ed. 2011
5.	**A. Drozdek,** Data Structures and Algorithms in C++, 4th Ed., Cengage Learning, 2013.
6.	**G.A.V PAI,** Data Structures and Algorithms, Concepts, Techniques and Applications, Volume1, 1st Edition, Tata McGraw-Hill, 2017.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO-CS	PSO-IT	PSO-CP
CO1	2	2	1	1					1	2	1	1
CO2	2	2	1	1					1	2	1	2
CO3	3	3	2	1			1		1	3	2	2
CO4	3	3	2	1	1		2	1	2	3	2	3

Avg	3	3	3	1	1		2	1	2	3	2	2

Data Structures-LAB (23B25MA111)

Introduction to Algorithm and Data Structures, operations on Data Structures, Linear Data Structures, Linked Lists, Stacks, Queues, Nonlinear Data Structures, Tree, Binary Search Tree, Sorting and Searching.

Course Description

Course Code	**23B25MA111**	**Semester Even**	**Semester II Session - 2022-23** **Month from** Jan - June 2023
Course Name	Data Structures-LAB		
Credits	1	**Contact Hours**	0-0-2
Faculty (Names)	**Coordinator(s)**		
	Teacher(s) (Alphabetically)		
COURSE OUTCOMES After pursuing this course, the students will be able to:			**COGNITIVE LEVELS**
CO1	demonstrate familiarity with major algorithms and data structures		Understanding Level (C2)
CO2	apply the appropriate linear data structure (stack, queue, linked list) and algorithm design method for a specified application.		Applying Level (C3)
CO3	apply sorting and searching techniques.		Applying Level (C3)
CO4	analyze the concepts of nonlinear data structures such as trees and graphs.		Analyzing Level (C4)
Module No.	**Title of the Module**	**List of Experiments**	**No. of Labs for the module**
1.	Introduction to Algorithm and Data Structures	1. Write an algorithm to find factorial of a number. 2. Write an algorithm to write Fibonacci sequence. 3. Write an algorithm to solve Tower of Hanoi. 4. Write an algorithm to find the largest among three different numbers entered by user.	4

2.	Linear Data Structures	5. Implement stack operations using array. 6. Conversion from infix to postfix expression using stack 7. Evaluation of postfix expression. 8. Implement queue operations using array.	4
3.	Linked Lists	9. Implement operations on single linked list. 10. Implement operations on double linked list. 11. Implement stack operations using linked list. 12. Implement queue operations using linked list.	4
4.	Sorting and Searching	13. Implement selection sort, insertion sort, bubble sort, quick sort, merge sort in C++ 14. Implement Linear search and Binary search in C++	2
5.	Non-Linear Data Structures	15. Implement binary tree using arrays and perform binary traversals. i) Inorder ii) preorder iii) post order 16. Write a C++ program to balance a given tree.	2
		Total number of Labs	**16**

Evaluation Criteria

Components	**Maximum Marks**
Lab Test 1	20
Lab Test 2	20
TA	60 (Quiz, Assignments, Tests, Viva)
Total	**100**

Project based learning: A group of 2 to 3 students will be formed. Each group will have a group leader to develop coordination among the group members. A problem of sorting, searching or data structures implementation will be given. The group leader will submit a report of findings with output for the same.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	**E. Horowitz, S. Sahni and D. Mehta,** Fundamentals of Data Structures in C++, 2nd Ed., University Press, 2016.
2.	**S. Sahni,** Data Structures, Algorithms, and Applications in C++, WCB/McGraw-Hill, 2005.
3.	**A. M. Tenenbaum,** Data Structures Using C, Pearson Ed, India, 1990.

4.	**N. Dale,** C++ Plus Data Structures, Jones & Bartlett Learning; 5th Ed. 2011
5.	**A. Drozdek,** Data Structures and Algorithms in C++, 4th Ed., Cengage Learning, 2013.
6.	**G.A.V PAI,** Data Structures and Algorithms, Concepts, Techniques and Applications, Volume1, 1st Edition, Tata McGraw-Hill, 2017.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO-CS	PSO-IT	PSO-CP
CO1	3	2	2	1			1		1	3	1	1
CO2	3	2	2	1			1		2	3	1	2
CO3	3	3	3	1			1		2	3	2	3
CO4	3	3	3	1	1		2	2	2	3	2	3
Avg	3	3	3	1	2		1	2	2	3	2	2

Calculus (23B21MA112)

Sequence and Series, Successive differentiation and Leibnitz's theorem, Partial differentiation, Taylor's series expansion of functions of several variables, maxima and minima of functions of several variables, Jacobians, multiple integrals, gradient, divergence and curl, normal and tangent to a surface, line and surface integrals, Gauss and Stoke's theorems, second order linear ordinary differential equations.

Course Description

Course Code	**23B21MA112**	**Semester: Even**	**Semester II Session 2022-23 Month from Jan-June 2023**	
Course Name	**Calculus**			
Credits	**4**		**Contact Hours**	3-1-0
	Coordinator(s)			
	Teacher(s) (Alphabetically)			
COURSE OUTCOMES After pursuing the above-mentioned course, the students will be able to:				**COGNITIVE LEVELS**
CO1	explain the concepts of convergence of sequence and series.			Understanding Level (C2)

CO2	make use of limits, continuity and differentiability in partial differentiation and solve the problems of maxima/minima.	Applying Level (C3)
CO3	apply the concepts of double and triple integrals to find area and volume of curves and surfaces.	Applying Level (C3)
CO4	make use of vector differentiation and integration to solve the problems related to Green's, Stoke's and Gauss divergence theorems.	Applying Level (C3)
CO5	solve the second order linear ordinary differential equations with constant coefficients and Cauchy-Euler equation.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures**
1.	Sequence and Series	Sequence of real numbers, bounded and monotone sequences, convergence of sequences, Cauchy sequences, sub sequences, Bolzano-Weierstrass theorem. Series of real numbers, comparison test, ratio test, root test, alternating series, absolute and conditional convergence, uniform convergence, power series.	7
2.	Partial Differentiation	Concepts of limit and continuity, partial derivatives, Euler's theorem, Chain rule, change of variables, Total differential, Jacobians.	6
3.	Applications of Partial Differentiation	Taylor's Theorem, maxima and minima, Lagrange's method of multipliers, estimation of error and approximation of function of two variables.	5
4.	Multiple Integrals	Gamma and Beta functions, Double integral, change of order, change of variables, Triple integrals, Dirchilet integrals, applications.	8
5.	Vector Differential Calculus	Scalar and Vector point function, Gradient, Directional Derivative, Divergence, Curl and their applications.	4
6.	Vector Integral Calculus	Line integral, Surface integral and Volume integral, Applications to work done by the force, Green's, Stoke's and Gauss divergence theorems and their applications.	7
7.	Differential Equations	Linear differential equations of second order with constant coefficients, Cauchy-Euler equation.	5
Total Number of Lectures			**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutorials)
Total	**100**

Project based learning: Each student in a group of 4-5 will apply the concepts of differential equations to solve real life practical problems.	
Recommended Reading material:	
1.	**Jain, R. K. & Iyengar, S. R. K.,** Advanced Engineering Mathematics, 5th Ed., Narosa Publishing House, New Delhi, 2019.
2.	**Kreyszig, E.,** Advanced Engineering Mathematics, 10th Edition, John Wiley& Sons, Inc., 2015
3.	**Joel R. Hass, Christopher E. Heil, Maurice D. Weir,** Thomas Calculus, 14th Ed., Pearson Education Asia (Addison Wesley), New Delhi, 2018.
4.	**Goldberg, R. R.,** Methods of Real Analysis, Oxford Publication, 1976.
5.	**Malik S. C.& Arora, S.** Mathematical Analysis, New Age International, 2010.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO-CS	PSO-IT	PSO-CP
CO1	1	2	1						1			
CO2	1	2	1						1			
CO3	1	2	1						2			
CO4	1	2	1		1				2			
CO5	1	2	2		2		2		2			
Avg	1	2	1		2		2		2			

Physics 2 (15B11PH211)

Gauss's Law and applications, Laplace and Poisson's Equations, Maxwell's Equations, Electromagnetic Waves, Poynting's theorem (derivation) and Poynting vector, Propagation of Electromagnetic waves in Free Space and Dielectric Media, normal and oblique incidence, Total internal Reflection and Brewster's Law, Lasers, Principle and Working of Ruby Lasers, Optical Fiber and their applications, Bonding in solids, Crystal Structure, Bragg's Law and X-ray Diffraction, Classical theory: Free electron theory of metals, Quantum theory of electronic conduction, Kronig Penney Model, Brillouin zone, Band Theory, Distinction between metals, Semiconductors and insulators on the basis of band theory of solids, Effective Mass.

Course Description

Course Code	15B11PH211	**Semester: Even**	**Semester: II** **Session 2022-23** **Month from: Jan to June 2023**
Course Name	Physics 2		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**		
	Teacher(s)		

COURSE OUTCOMES After pursuing the above-mentioned course, the students will be able to:		**COGNITIVE LEVELS**
CO1	Recall the basic concepts relating to electromagnetic theory, lasers, fiber optics and solid state physics.	Remembering Level (C1)
CO2	Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved.	Understanding Level (C2)
CO3	Apply the basic principles in solving a variety of problems related to lasers, electromagnet theory, fiber and solid state physics.	Applying Level (C3)
CO4	Analyze and examine the solution of the problems using physical and mathematical concepts involved in the course.	Analyzing Level(C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Electromagnetism**	Introduction of electromagnetism, Basic idea of Cartesian, Spherical polar and cylindrical coordinate systems, Basics of fields, Gradient, Divergence and Curl, Coulomb's law, Electric Flux & Gauss's law, Applications of Gauss law for Spherical and Cylindrical symmetries (all important cases), Electric field due to charged conductor, Force per unit area on the surface of the charged conductor, Laplace and Poisson's equations and their applications to solve electrostatic problems in Cartesian and cylindrical systems, Treatment of electrostatic problems using Laplace and Poisson's equations in spherical coordinate system, Maxwell's correction to Ampere's law, Displacement current, Maxwell's equations in free space and dielectric media (both differential and integral forms) Poynting's theorem (derivation) and Poynting vector, Electromagnetic waves in free space (equations	17

		and solutions) and Transverse nature of EM waves, Energy and momentum in EM waves, Radiation pressure, Propagation of EM waves through boundary, Boundary Conditions across the medium ,Reflection and Transmission of EM waves at normal incidence, Reflection and Transmission at oblique incidence- Laws of Reflection and Refraction , Oblique incidence- p polarization, Fresnel's equations, Total internal Reflection and Brewster's Law for EM waves	
2.	**Lasers, Optical Fiber and their applications**	Introduction to Laser, spontaneous and stimulated emission, population inversion, Einstein A and B coefficients, Principles and working of lasers, Three level Laser Scheme, Ruby laser, Applications of lasers , Concept of optical fiber and Principle of Total Internal Reflection in optical fiber, Numerical aperture and Single, multistep & graded index fiber, Attenuation coefficient, Transmission losses in optical fiber, Applications of an optical fiber: Endoscopy and sensing applications (discussion of one specific example) of an optical fiber.	08
3.	**Solid State Physics**	Basic ideas of Bonding, Ionic bonding, covalent bonding and Metallic Bonding, Inter-atomic coulomb forces in ionic crystals and Determination of equilibrium separation, Minimum Potential energy and determination of Madelung constant 'α 'for NaCl crystal in 1D , Lattice points and space lattice, Basis and crystal structure, Unit cell and Primitive cell, Seven crystal systems and Fourteen, Bravais	15

		space lattice, Coordination number, nearest neighbor distance, atomic radius and packing factor in crystal structure, Calculation of lattice constant, Lattice planes and Miller indices, Separation between lattice planes, Derivation and examples, X-ray diffraction, Bragg's law of X- ray diffraction, Electrical properties of metals: Classical free electron theory of conduction in metals, Quantum mechanical treatment: Quantum theory of electronic conduction in metals, Kronig Penney Model: Periodic Potential and Allowed Energies, Emergence of Bands through Kronig Penney Model and Band Theory of Solids, Distinction between metals, Semiconductors and insulators, intrinsic and extrinsic semiconductors, Effective Mass: Concept and Significance, Brillouin zone: Relation with Lattice Structures, Types of Brillouin zones, Energy and Momentum ,Brillouin zone: Origin of Forbidden Bands	
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	**20**
T2	**20**
End Semester Examination	**35**
TA	**25 (**Quiz, Assignments, etc.)
Total	**100**

Project Based Learning: The students will do projects on applications of electromagnetic theory, lasers, fiber optics and solid state physics. This will help them identify the role of physics in industries related to optical communication, medicine and electronics.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	D. J. Griffiths, *Introduction to electrodynamics*, 4th illustrated revised edition,

	Pearson India 2019
2.	G. Keiser, *Optical Fiber Communications*, Tata Mc Graw Hill Education 2013
3.	A. Beiser, *Concepts of Modern Physics*, 6th revised edition, Mc Graw Hill International 2002
4.	S. O. Pillai, *Solid State physics*, 8th Edition, New Age International (P) Limited 2018
5.	B. G. Streetman & S. Banerjee, *Solid State Electronic Devices*, 7th illustrated edition, Prentice-Hall India 2015

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO-CS	PSO-IT	PSO-CP
CO1	1	1	1				1		1			
CO2	2	1	1				1		1			
CO3	2	2	1				1					
CO4	2	2	2				1					
Avg												

Environmental Science (23B12BT111)

The Multidisciplinary nature of environment, principles of Biodiversity & conservation, overview of various Natural resources including Energy, their consumption & conservation strategies, different forms of Pollution, hazardous waste management, Urban planning, Disaster management, Environmental Policies, Laws, Regulations, ethics and a Field Work component that appraises students with issues in environment in current context.

Course Description

Subject Code	23B12BT111	**Semester: Even**	**Semester: II Session: 2022-2023** **Month from: JAN-JUN**
Subject Name	**Environmental Science**		
Credits	**2**	**Contact Hours**	**2-0-0**
Faculty (Names)	**Coordinator(s)**		
	Teacher(s) (Alphabetically)		

COURSE OUTCOMES After pursuing the above-mentioned course, the students will be able to:		**COGNITIVE LEVELS**
CO1	explain fundamental principles of environment, ecosystem resources, biodiversity and conservation.	Understand Level (C2)

CO2	identify hazards related to environmental pollution and learn environmentally safe and sustainable practices.		Apply Level (C3)
CO3	interpret modern techniques for Disaster management, global environmental concerns, Government regulations, Environmental Policies, Laws & ethics.		Understand Level (C2)
CO4	make use of ground situation on specific environmental aspects, examine risks involved, make a field report and present the findings.		Apply Level (C3)
Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	The Multidisciplinary nature of environment	Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, Case studies.	3
2.	Biodiversity & conservation	Diversity of flora and fauna, species and wild life diversity, Biodiversity hotspots, threats to biodiversity, Case studies	3
3.	Natural resources, Energy consumption & conservation	Water, Land, Energy (Renewable, non-renewable, wind, solar, hydro, Biomass) resources, Global Conventions on Energy, Kyoto protocol, Case studies.	8
4.	Pollution, hazardous waste management	Air, Water & Land, pollution, sources & causes, effects, Electronic waste, nuclear hazards, Case studies.	6
5.	Urban planning, Disaster management	Sustainable building, Disaster Management and Contingency Planning, Critical issues concerning Global environment Urbanization, global warming, climate change, acid rain, ozone depletion etc Case studies	4
6	Environmental Policies, Laws, Regulations & ethics	Environmental Policy and laws, Different Acts such as: Environmental Protection Act, Air and Water Acts, Wildlife and Forest Acts), SPCB and CPCB, their roles and responsibilities.	4
7	Field Work/	Explore the current environment related occurrences at national and international level, Study of successful sustainable measures, a know-how of industries in local region and their possible effects, measure of water, air and	2

		land quality, Visit to a local polluted site-Urban/Rural /Industrial / Agricultural, Study of simple ecosystems.	
		Total number of Lectures	**30**

Evaluation Criteria

Components	**Maximum Marks**
Mid	30
End	40
Teachers Assessment (TA)	30
Total	**100**

PBL: Visit to a local polluted site-Urban/Rural /Industry/Agricultural, Survey ground situation on specific environmental aspects, and their possible impacts on water, air and land quality, identify risks involved, make a field report and present the findings

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Benny Joseph, Environmental Studies Simplified, 3rd Edition, McGraw Hill Education, India, Published 2nd August, 2017
2.	Erach Bharucha, Textbook of Environmental Studies for UG Courses, 3rd Edition, Orient Black Swan, Published 1st Jan 2013
3.	Issues of the Journal: Down to Earth, Published by Centre for Science and Environment (CSE), Delhi

CO-PO and CO-PSO Mapping:

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**
CO1					3							
CO2				1	2	3		1	2			
CO3				2	2	3		1	2			
CO4					3	2	2	3	2			
Avg				2	3	3	2	2	2			

Object Oriented Analysis and Design- Project Based Learning (23B56CS123)

Course Description

Subject Code	23B56CS123	**Semester Even**	**Semester: II Session: 2022- 2023 Month from Jan to June 2023**

Subject Name	Object Oriented Analysis and Design- Project Based Learning		
Credits	**2**	**Contact Hours**	0-0-4
Faculty (Names)	**Coordinator(s)**		
	Teacher(s) (Alphabetically)		

COURSE OUTCOMES After pursuing the above-mentioned course, the students will be able to:		**COGNITIVE LEVELS**
CO1	explain object-oriented programming fundamentals	Understand Level (C2)
CO2	interpret logic building of real case studies solution using object-oriented concepts	Understand Level (C2)
CO3	develop and experiment with programs using object-oriented programming.	Apply Level (C3)
CO4	develop and integrate project in a team	Apply Level (C3)
CO5	evaluate technical report detailing the problem statement, proposed methodology, software specification, design specifications, test plan, and implementation details.	Evaluate Level (C5)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Labs for the module**
1.	Fundamentals of C++	Basic C++ Programming, Basic Data Type, User defined data type, operators, type cast, expressions, Functions	4
2	Introduction to OOAD with C++	Object Model, Object Modeling Technique(OMT), Classes and Objects, Responsibilities, Relationships	4
3	Object Oriented Design and Analysis using UML	Use Case Diagrams, Class Diagram, Sequence Diagram, State Diagrams, Collaboration Diagrams	4
4	OOAD Implementation	Object oriented concepts and programming using C++	4
5	Advanced OOAD	Inheritance, Polymorphism, templates, STL, sorting and searching	4

	implementation		
6	OOAD Case studies	Apply and Experiment OOAD in different context	4
7	Project	Analyze and identify various OOAD principles for project Develop, design, implementation, plan, demonstrate	3
8	Prepare technical report	Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation detail	3
		Total number of Labs	**30**

Evaluation Criteria

Components	**Maximum Marks**
Assessment	40
Viva Voice of Project (Mid and Final)	35
End Semester Report + Presentation	15
Attendance	10
Total	**100**

Project based learning: Project is an integral part of the lab. Students form a group (of size 3), and discuss their project ideas with their faculty before finalizing their research areas. The project is done using object-oriented programming language and develops applications ranging from basic to advanced problem statements. This helps students in understanding the working of project development in companies and also broadens the spectrum for team work and procedural implementation of projects in hand to be delivered to clients as per the requirements.

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO-CS	PSO-IT	PSO-CP
CO1	3	2							2			
CO2	1	3	1		1	1	2	2	2	1	1	1
CO3	2		3	2			1		2			
CO4	1		2	2	1	1	2		2	2	2	
CO5	2	1	1	1	2	2	3	2	2	1	1	2
Avg	2	2	2	2	2	2	2	2	2	2	2	2

UNIX Workshop (23B58CS125)

The course lays emphasis on UNIX environment. A number of concepts are taught in UNIX which aids in managing network systems such as file, web, database, printer, etc servers. It is increasingly used in engineering and design and for some home users. The most common use is in networks administration and security.

Course Description

Course Code	**23B58CS125**	**Semester: Even**	**Session: 2022-23** **Month from: Jan - June 2023**
Course Name	UNIX Workshop		
Credits	2	**Contact Hours**	1-0-2
Faculty (Names)	**Coordinator(s)**		
	Teacher(s) (Alphabetically)		

COURSE OUTCOMES After pursuing the above-mentioned course, the students will be able to:		**COGNITIVE LEVELS**
CO1	demonstrate use of common Unix/Linux commands	Understanding Level (Level 2)
CO2	apply Unix/Linux file redirection and pipelining to combine utilities to perform complex tasks	Apply Level (Level 3)
CO3	develop shell scripting using Selection, Case & Conditional Statements	Apply Level (Level 3)
CO4	build shell scripts to solve various problems using commands like grep, line number, test, expressions, compare, command line input, etc.	Apply Level (Level 3)
CO5	build and manage files and directories, file permissions, and navigate the Unix/Linux file system	Apply Level (Level 3)

Module No.	**Title of the Module**	**List of Experiments**	**No. of Labs for the module**
1.	The UNIX File System & Basic Commands	1. Understanding the UNIX File System & Execute Basic Commands: To make a study of UNIX Environment and execute basic commands.	1
2.	UNIX Editor & Operations	2. Working with UNIX Editor & understand UNIX processes Operations: To understand working with UNIX Editor and UNIX Processes, Process Utilities.	1
3.	UNIX File Handling & Regular Expressions	3. Working with Directories: To work with Directories such as creation, searching, moving, deleting etc. 4. Working with Files: To work with Files such as creation, searching, moving, deleting etc.	3

		5. Using Regular Expressions for Searching: Using Regular Expressions for Searching in a File or Directory.	
4.	UNIX Advanced Filters	6. Working with UNIX pipe: Using UNIX pipe to connect two or more commands. 7. Working with UNIX filters: Working with filters to process text in different ways. 8. Working with UNIX advance filters: Working with advance filters, performing Advanced Pattern Matching with Stream-oriented & Non-Interactive Text Editor.	3
5.	UNIX Shell Scripting	9. Working with UNIX Shell: Working with UNIX Shell for basic problems using variables and naming conventions. 10. Performing UNIX Shell Scripting: Performing UNIX Shell Scripting with Conditional Constructs, Looping Statements, Arrays, Functions for problem solving.	2
6.	UNIX Administration	11. Performing Document handling through Shell Scripting – Performing Document Handling, Quoting, and Parsing text. 12. Working with UNIX Administration: Working with UNIX Administration, Login Process, Users & Permission and Process Management.	2
		Total number of Labs	**12**

Evaluation Criteria

Components	**Maximum Marks**
Mid	30
End	40
Day-to-Day	30 (Quiz + Assignment + Class Test + Attendance)
Total	**100**

Project based learning: Each student in a group of 2 will apply the advanced programming concepts in UNIX Environment to solve practical problems.

Text Books

1.	Richards Stevens, Advanced Programming in the UNIX Environment, Pearson Education India, 2005
2.	Sumitabha Das, UNIX Concepts & Applications, 4th Edition, Tata McGraw-Hill Education, 2008

Reference Books

1.	Maurice J. Bach, Design of UNIX Operating System, Prentice-Hall, 1986
2.	Marc J. Rochkind, Advanced UNIX Programming, 2nd Edition, Pearson Education, 2004
3.	Evi Nemeth, Garth Snyder, Trent R. Hein, Unix and Linux System Administration Handbook, 4th Edition Pearson Education India, 2011
4.	Richards Stevens, Unix Network Programming, Addison-Wesley Professional, 2004

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO-CS	PSO-IT	PSO-CP
CO1	2	1	1	1			1	1	1	2	2	2
CO2	2	1	2	1			1	1	1	2	2	2
CO3	2	2	2	1			1	1	1	2	2	2
CO4	2	2	2	1			1	1	1	2	2	2
CO5	2	1	1	1			1	1	1	2	2	2
Avg	2	2	2	1			1	1	1	2	2	2