LNCT UNIVERSITY, BHOPAL

Programme:- BCA (AI&DA) **Semester – III** **wef: July 2025**

Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
Object Oriented Programming in C++ (Major)	**BAI-301**	**L**	**T**	**J**	**EST**	**CAT**	**Total**
		3	1	0	70	30	100

Course Objective	The aim of this course is to learn object oriented features and programming concepts of C++.

Units	Contents (*Theory*)	Hours /week
I	**Introduction:** Procedure-oriented programming, Concepts of Object-oriented programming, Structure of C++ program. Tokens, Keywords, Identifiers and constants, Basic Data Types, User-defined data types, Derived data Types, Symbolic constants, Declaration of variables, Operators in C++, Scope resolution operator, Memory management operators, Manipulators, Type cast operator, Expressions and their types, Operator overloading, Operator precedence, Control structures.	**8**
II	**Functions:** The main function, Function prototyping, Call by Reference, Return by Reference, Inline functions, Default arguments, const arguments, Function overloading.	**8**
III	**Classes and Objects:** Specifying a Class, Defining member functions, Making an Outside function Inline, Nesting of member functions, Private member functions, Arrays within a Class, Static data members, Static member functions, Arrays of Objects, Objects as function arguments, friendly functions, Returning Objects, const member functions, Pointers to members.	**8**
IV	**Constructors and Destructors:** Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, copy constructor, Dynamic constructor, Constructing Two-dimensional arrays, Destructors.	**8**
V	**Inheritance and Polymorphism:** Programming concepts and types. Console I/O Operations: C++ streams, C++ stream classes, Unformatted I/O operations, Formatted I/O operations, managing output with manipulators.	**8**

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
E. Balagurusamy	Object Oriented Programming with C++ -	6th Edition	Tata McGraw-Hill Publishing
Robert Lafore	OOPS and C++	4th Edition	Course Sams Publishing
Stephen Prata	C++ primer plus	6thEdition	Addison-Wesley Professional
Al Stevens.	Teach yourself C++	5th Edition, 1997	Wiley

COURSE OUTCOMES: Students will be able to	
CO1	Understand the concepts of Object-oriented programming, data types, variables, Operators, Control structures**.**
CO2	Describe inline functions in C++**.**
CO3	Apply the concepts of Object-Oriented programming**.**
CO4	Illustrate the process of data file manipulations using C++
CO5	Use exception handling in C++ programs.

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Data Base Management System (Minor)	BAI-302	3	1	0	70	30	100

Course Objective	The objective of this course is to learn fundamentals of data models and to represent a data base system using ER diagrams, study of SQL and relational data base design.

Units	Contents (*Theory*)	Hours /week
I	**Database Concepts:** Data, Information & Knowledge, Introduction to Database Management System (DBMS): Database Concepts, characteristics of data in database, Advantages of DBMS, Overview of Database Models: Hierarchical Model, Network Model, Relational Model and Object Oriented Model. Three levels of Database Architecture: Conceptual, Physical and Logical levels. Entity Relationship Model: Entity, Attributes, Relationships, E-R Modeling Symbols.	**8**
II	**Relational DBMS:** RDBMS Terminology, Relational Data Structure, Data Integrity, Codd's Rule, Overview of Relational Algebra and Relational Calculus, Relational Database Design: Primary Keys, Foreign Keys, Candidate Keys, Relationships, Normalization, Purpose of Normalization, First Normal Form, Second Normal Form, Third Normal Form.	**8**
III	**SQL:** SQL Data Types and Literals, DDL, DML, DQL, DCL, DAS, TCS, SQL operators, Creating Database, Creating, Modifying and Deleting Tables, Creating View, Indexes, Queries: Insert, Select, Update, Where Clause, Having Clause, Sub-Queries, Order By, Grouping, Creating Variables, Functions: Aggregate and Scalar, Joins, Unions, Triggers, Procedures.	**8**
IV	**Transactions:** Transaction concept, Transaction Properties, Transaction States, **Concurrency Control:** Concurrency Control Schemes - Lock Based Protocols, Timestamp Based Protocols, Deadlock handling, User Defined Transactions.	**8**
V	**Database Security:** Data Security Risks, Data security requirements, Database Users, Database Backup, Database Recovery: Types of database Failures, Recovery Techniques -Deferred Update, Database Privileges – System Privileges and Object Privileges, Overview of Data Storage Devices.	**8**

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Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Silberschatz, Korth & Sudarshan	Database System Concepts	7th ed., 2018	McGraw Hill, New York
S. K. Singh	Database Systems, Concepts, Design and Applications	2011	Dorling Kindersley (India)
Raghu Ramakrishnan, Johannes Gehrke	Database Management Systems	2nd ed., Release, 2001	McGraw-Hill
Elmsari, Navathe	Fundamentals of Database Systems	5th Edition	Pearson Education

COURSE OUTCOMES: Students will be able to

CO1	Understand database concepts and database management system software
CO2	Understand RDBMS and Normalization.
CO3	Write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
CO4	Understand Transactions
CO5	Identify database failures and understand database privileges.

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Statistical Modelling and Data Reasoning with Python (Major)	**BAI-303**	3	1	0	70	30	100

Course Objective	To build a foundation in statistical concepts, probability, estimation, and hypothesis testing, enabling students to analyze data and perform Bayesian and frequentist inference using Python.

Units	Contents (Theory)	Hours /week
I	**Introduction to Statistics:** Introduction to Statistics. Role of statistics in scientific methods, current applications of statistics. **Scientific data gathering**: Sampling techniques, scientific studies, observational studies, data management. **Data description:** Displaying data on a single variable (graphical methods, measure of central tendency, measure of spread), displaying relationship between two or more variables, measure of association between two or more variables.	**8**
II	**Probability Theory:** Sample space and events, probability, axioms of probability, independent events, conditional probability, Bayes' theorem.	**8**
III	**Random Variables:** Discrete and continuous random variables. Probability distribution of discrete random variables, binomial distribution, poisson distribution. Probability distribution of continuous random variables, The uniform distribution, normal (gaussian) distribution, exponential distribution, gamma distribution, beta distribution, t-distribution, χ" distribution. Expectations, variance and covariance. Probability Inequalities. Bivariate distributions.	**8**
IV	**Point Estimations:** Methods of finding estimators, method of moments, maximum likelihood estimators, bayes estimators. Methods of evaluating estimators, mean squared error, best unbiased estimator, sufficiency and unbiasedness **Interval Estimations:** Confidence interval of means and proportions, Distribution free confidence interval of percentiles.	**8**
V	**Test of Statistical Hypothesis and p-values: Tests** about one mean, tests of equality of two means, test about proportions, p-values, likelihood ratio test, Bayesian tests **Bayesian Statistics:** Bayesian inference of discrete random variable, Bayesian inference of binomial proportion, comparing Bayesian and frequentist inferences of proportion, comparing Bayesian and frequentist inferences of mean **Univariate Statistics using Python:** Mean, Mode. Median, Variance, Standard	**8**

	Deviation, Normal Distribution.	

Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
David S. Moore, George P. McCabe, Bruce A. Craig	Introduction to the Practice of Statistics	9th	W.H. Freeman
Ronald E. Walpole et al.	Probability and Statistics for Engineers and Scientists	9th	Pearson
Allen B. Downey	Think Stats: Probability and Statistics for Programmers	2nd	O'Reilly Media
Larry Wasserman	All of Statistics	1st	Springer
Peter M. Lee	Bayesian Statistics: An Introduction	4th	Wiley

COURSE OUTCOMES: Students will be able to

CO1	Explain descriptive statistics, data collection techniques, and measures of association.
CO2	Apply probability rules, conditional probability, and Bayes' theorem to solve problems.
CO3	Use probability distributions and evaluate expectations, variances, and joint distributions.
CO4	Estimate parameters using various techniques and construct confidence intervals.
CO5	Perform hypothesis testing and compare Bayesian and frequentist methods using Python.

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Discrete Maths (GEC)	BAI-304	3	1	0	70	30	100

Course Objective	The objective of this course is to learn the basics about Discrete structure.

Units	Contents (Theory)	Hours /week
I	**Set Theory:** Elements of a set, methods of describing a set, types of sets, Operations on sets, union, intersection and difference of sets, Venn diagrams, statement problems, Associative Laws, Distributive laws, DeMorgan‟s laws, duality, partitioning of a set.	8
II	**Relations and Functions:** Basic definition of relation, types of relations, graphs of relations, properties of relations, Matrix representation of a relation. Function definition, Type of functions, One to one, into and onto function, Inverse function, Composition of functions, Recursively defined function, Pigeonhole principle.	8
III	**Algebra Of Logic, Mathematical Induction:** Propositions and Logic operations, truth tables, arguments and validity of arguments, propositions generated by a set, equivalence and implication laws of logic, mathematical system and propositions over a universe, Quantifiers, Principle of Mathematical Induction.	8
IV	**Graph Theory:** Various types of graphs- Simple and multi graphs, directed and undirected graphs, Eulerian and Hamiltonian graphs, Graph connectivity, graph traversals, graph optimizations, graph coloring, Trees, spanning trees.	8
V	**Recursion And Recurrence Relations:** Recursion, many faces of recursion, recurrence relations, some common recurrence relations, Matrix Operations- Addition, Subtraction, Multiplication and Inverse.	8

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
Tremblay J.P. and Manohar R	Discrete Mathematical Structure with application to Computer Science	30th Reprint (2007)	McGraw Hill
Seymour Lipschutz and Marc Lipson.	Discrete Mathematics	Third Edition	Outline Series
Doerr A & Kenneth L.	Applied Discrete Structure of Computer Science	Paperback Edition	Galgotia Pub. Pvt.Ltd. New Delhi
Swami M.N.S &Thisiraman E	Graphics Networks and Algorithms	Second Edition	John Wiley & Sons

COURSE OUTCOMES: Students will be able to	
CO1	Understand the concepts of set theory, laws, Venn diagrams.
CO2	Describe the relations, types of relations, functions**,**
CO3	Apply the concepts of Propositions and Logic operations, Principle of Mathematical Induction.
CO4	Use Graph theory in various optimization problems.
CO5	Apply many faces of recursion, recurrence relations, Matrix Operations.

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Data Visualization (SEC)	BAI-305	3	1	0	70	30	100

Course Objective	Understanding data analysis and handling for effective interpretation, students will apply statistical and financial functions, utilize Excel and Power BI for visualization, and analyze data using advanced tools and techniques to derive actionable insights.

Units	Contents (Theory)	Hours /week
I	**Introduction To Data Handling** Overview of Data analysis, Introduction to Data visualization, Working with statistical formulas - Logical and financial functions.	8
II	Power BI Analytics, Data Validation & data models, Power Map for visualize data , Power BI-Business Intelligence , Data Analysis using statistical methods, Dashboard designing.	8
III	**Introduction To Data Manipulation Using Function**: Heat Map, Tree Map, Smart Chart, Azure Machine learning, Column Chart, Line Chart, Pie,Bar, Area, Scatter Chart, Data Series, Axes , Chart Sheet ,Trendline , Error Bars, Sparklines, Combination Chart, Gauge, Thermometer Chart. Gantt Chart, Pareto Chart etc , Frequency Distribution, Pivot Chart, Slicers , Tables: Structured References, Table Styles , What-If Analysis: Data Tables| Correlation model |Regression model.	8
IV	**Data Strategy & Consumer behaviour Analytics:** Understanding Product & Category, Competitive Analysis, Market Share understanding- Market potential Index, Seasonality-Sales Trending, Consumer behaviour Analytics-MIND AND MARKET FACTORS.Budget planning & Execution- MIMI, Regression & Correlation Analysis for Sales trending, Forecasting method with predictive investment modelling, Cohort Analysis, Google Analytics(GA), Case Studies-Assignments.	8
V	**TABLEAU SOFTWARE: GETTING STARTED WITH TABLEAU SOFTWARE:** What is Tableau? What does? the Tableau product suite comprise of? How Does Tableau Work? Tableau Architecture, What is my Tableau Repository? Connecting to Data & Introduction to data source concepts, Understanding the Tableau workspace, Dimensions and Measures, Data Types & Default Properties, Building basic views, saving and Sharing your work-overview. Introduction to Qlikview and other tools.	8

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Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
S. Christian Albright, Wayne L. Winston	Data Analysis and Decision Making	6th	Cengage Learning
Adam Aspin	Data Visualization with Microsoft Power BI	2nd	Apress
S. Christian Albright, Wayne L. Winston	Business Analytics: Data Analysis & Decision Making	7th	Cengage Learning
Jinjer Simon	Excel Data Analysis: Your Visual Blueprint for Analyzing Data, Charts, and PivotTables	3rd	Wiley
Brett Powell	Mastering Power BI	2nd	Packt Publishing

COURSE OUTCOMES: Students will be able to

CO1	Understand the fundamentals of data analysis and data handling techniques.
CO2	Apply various data visualization tools using Excel and Power BI.
CO3	Utilize logical, statistical, and financial functions for analytical purposes.
CO4	Create advanced charts and visualizations like Heat Map, Tree Map, Gantt, and Pareto.
CO5	Perform correlation, regression, and What-If analysis using modern data modeling tools.

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Name of Paper & Category	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Programming Lab in C++ (Major)	BAI-306	2	-	70	30	100

Contents (Practical):-

1. Write a C++ program to calculate the average of three numbers.
2. Write a C++ program to find the biggest of three numbers.
3. Write a C++ program to find minimum and maximum of two numbers using functions.
4. Write a C++ program to check the given number is palindrome or not
1. Write a C++ program to sum of all even and odd numbers.
2. Write a C++ program to perform arithmetic operations using classes and objects.
3. Write a C++ program to define a student class with user name, to name, total, average for “n” students.
4. Write a C++ program to illustrate the use of static member function.
5. Write a C++ program to find the mean value using friend function..
6. Write a C++ program to show the use of copy constructor.
7. Write a C++ program to implement multiple inheritances.
8. Write a C++ program to read a string with get line function.
9. Write a C++ program to implement processing shopping list using a class with arrays as data members.
10. Write a C++ program to show the use of over loaded constructor.
11. Write a C++ program to construct variables at run time using dynamic initialization.
12. Write a C++ program to demonstrate single inheritance.
13. Write a C++ program to implement multilevel inheritance.
14. Create a project using object oriented features and file handling in C++.

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Name of Paper & Category	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Programming Lab in DBMS (Minor)	BAI-307	2	-	70	30	100

Contents (Practical):

1. Write a query to create information of 'employees' (table name) in an organization with field Emp_id, EName, Salary, Commission, Hire_date, Address.
2. Write a Query to selective insertion only for Name and salary. (We assume that NOT NULL constraint apply is not on other fields).
3. Write a Query to display Name and Salary of employees table where salary is equal 5000.
4. Write a Query to display total income of every employee.
5. Write a Query to display employees name in descending order with salary.
6. Write a Query to display salary of employees between 40,000 to 50,000.
7. Display the Ename, which is start with j, k, l or m.
8. Write a PL/SQL for select, insert, update and delete statements.
9. Display name, hire date of all employees using SQL.
10. Display details of first 5 highly paid employees in SQL.
11. Write a data base trigger, which should not delete from Emp table if the day is Sunday.
12. Solving the case studies using ER Data Model (design of the database) & implement a Mini Project for the any problem taken by you.