

## B. Ed. (Information and Communication Technology Education)

1. Course Title:	Teaching ICT and Object Oriented Programming & Database	4. Full marks:	75 + 25
2. Course No:	ICTED 321) (3 <sup>rd</sup> paper)	5. Pass marks:	35% + 40%
3. Nature of Course:	Theory and Practical	6. Period per week:	6 + 3

### Course Description

Object-oriented programming is an approach to thinking about computation and problem solving in Object Oriented Paradigms. This course lays out the principles of object-oriented programming in C++ Programming Language. The course helps the students to discover the basic concepts of object-oriented programming in C++. The database management system consists of introduction, data models, relational model, relational languages, relational database design, security issues, query processing, filing and files structure, crash recover, concurrency control, and advanced database model. It also introduces the concept of computer science teaching methodology.

### General Objectives

- (a) to introduce the fundamentals of C/C++ programming,
- (b) to present the defensive programming style required by the C/C++ programming language,
- (c) to explore the facilities offered by C++ for object-oriented programming.
- (d) to provide fundamental concept, theory and practices in design and implementation of DBMS,
- (e) to equip with the detail aspects of computer science teaching methodology interacting computer science education in the secondary level.

S.N	Objectives	Contents	Periods	Teaching Strategies	References	Evaluation
1.	-Familiarization of the oriented programming system. -Development of the program. -Case study of different	<u>Introduction to Object Oriented Paradigm</u> Object-Oriented Programming as a New Paradigm, A Way of Viewing the World- Agents, Computation as Simulation, Coping with Complexity: The Nonlinear Behavior of Complexity: Abstraction Mechanisms,	16	-Lecture -Practical -Discussion -Group work	Lafore Chap 1	-Short question -Long question -Multiple choice

	types of systems related to object oriented programming.	Reusable Software. Object-Oriented Design: Responsibility Implies Noninterference, Programming in the Small and Programming in the Large, Role of Behavior in OOP, Case Study: Responsibility-Driven Design, CRC Cards, Components and Behavior, Software Components, Formalize the Interface, Design the Representation for Components, Implementing Components, Integration of Components, Maintenance and Evolution				
2.	-Understand the classes, methods, and messages. -Explain/ Define implementation of varieties of classes. -Implementation of methods and message passing systems.	<b><u>Classes, Methods and Messages</u></b> Encapsulation, Varieties of Classes, Interface and Implementation, Classes and Methods in C++, Message-Passing Formalism, Message Passing Syntax in C++, Issues in Creation and Initialization; Stack Versus Heap Storage Allocation, Memory recovery, Pointers; Mechanisms for Creation and Initialization in C++, Case Study: The Eight Queen Puzzle in C++.	17	-Lecture -Practical -Discussion -Group work	Lafore Chap 7 - 9	-Short question -Long question -Multiple choice
3.	-Identify different types of inheritances. -Develop the program for different inheritance system.	<b><u>Inheritance and Software Reusability</u></b> Introduction to Inheritance, Subclass, Subtype, and Substitutability; Forms of Inheritance, Inheritance in C++, Inheritance- Its merit and demerits, Inheritance and Substitutability, The <i>is-a</i> rule and the <i>has-a</i> rule, Composition and Inheritance, Software reusability	11	-Lecture -Practical -Discussion -Group work	Lafore Chap 10	-Short question -Long question -Multiple choice
4.	-Understand polymorphism and its importance. -Comprehend varieties	<b><u>Polymorphism</u></b> Polymorphism in Programming languages, Varieties of Polymorphism, Polymorphic Variables, Overloading,	12	-Lecture -Practical -Discussion -Group work	Lafore Chap 13	-Short question -Long question

	of polymorphic variables and its applications.	Overriding, Deferred Methods, Pure Polymorphism, Generic and Templates, Polymorphism in C++ and, Case Study: Container Classes and The Standard Template Library				-Multiple choice
5.	-Understand basic of database. -Application of database.	<b><u>Introduction</u></b> Concept and applications, Motivation, Objectives and Evolution, needs and organizations of database, Data abstraction, Data independence, Schema and Instances, Concept of DDL and DML, Database Manager and users, Needs of DBMS.	4	-Lecture -Discussion	Majumdar Chap 1	-Short question -Multiple choice
6.	-Identify different data model	<b><u>Data Models</u></b> Logical, Physical and Conceptual Model, E-R Model, Network Data Model, hierarchical Data Model.	5	-Lecture -Practical -Discussion -Group work	Majumdar Chap 3, 4	-Short question -Multiple choice
7.	-Understand and apply relational algebra. -Understand and apply relational calculus.	<b><u>Relational Model</u></b> Definitions and terminology, structure of relational databases, The relational algebra, The relational calculus, Schemas and Views.	5	-Lecture -Practical -Discussion -Group work	Majumdar Chap 4	-Short question -Long question -Multiple choice
8.	-Define and carry out implementation of different relational languages.	<b><u>Relational languages</u></b> SQL, DDL and DML, QBE.	5	-Lecture -Practical -Discussion -Group work	Majumdar Chap 4	-Short question -Long question -Multiple choice
9.	-Identify different types	<b><u>Relational Database Design</u></b>	10	-Lecture	Majumdar	-Short

	of relational database design. -Understand the use of normalization for reducing redundancy.	Introduction, Integrity constraints, Referential Integrity, Multi-valued and Join Dependencies, Normalization, Normal Forms, User schema or views design, Decomposition of relation schemes.		-Practical -Discussion -Group work	Chap 5, 6	question -Long question -Multiple choice
10.	-Determine security principle in the database design.	<b><u>Security</u></b> Needs of security, Security and integrity violations, Access control, Authorization, Security and Views, Encryption and decryption.	3	-Lecture -Discussion -Group work	Majumdar Chap 9	-Short question -Multiple choice
11.	-Extraction of required information from database. -Implementation of query processing system.	<b><u>Query Processing</u></b> Introduction to query processing, Query interpretation, Equivalence of expressions, Query Optimization, Join strategies, Query decomposition.	4	-Lecture -Practical -Discussion -Group work	Majumdar Chap 6	-Short question -Long question -Multiple choice
12.	-Understand the need of filing system. -Implementation of the different types of filing system.	<b><u>Filing and File Structure</u></b> Needs of filing, Overview of storage devices, Organization of records into blocks, File organizations, The sequential and the indexed sequential file organizations.	5	-Lecture -Practical -Discussion -Group work	Majumdar Chap 2, 3	-Short question -Long question -Multiple choice
13.	-Recover data during crash. -Implementation of different recovery system	<b><u>Crash Recovery</u></b> Introduction to crash recovery and its importance, Failure classification, Backup-recovery, Storage hierarchy, Transaction model, Log-based recovery, Shadow paging.	4	-Lecture -Discussion -Group work	Majumdar Chap 7 - 9	-Short question -Multiple choice
14.	-Familiarization of different transaction	<b><u>Concurrency Control</u></b> Introduction, Transaction and	5	-Lecture -Practical	Majumdar Chap 10	-Short question

	processing. -Handling of the system during deadlock.	Transaction processing, Scheduling and Serializability, Locking and Lock based protocols, Time-stamping-based protocols, Deadlock handling, Multiple Granularity.		-Discussion -Group work		-Long question -Multiple choice
15.	-Understand the recent database techniques.	<b><u>Advanced Database Model</u></b> Extended Relational Model, Object-Oriented Model, Distributed Model.	4	-Lecture -Discussion -Group work	Majumdar Chap 11	-Short question -Multiple choice
16.	-Deals with the teaching methodology in the case of computer science teaching.	<b><u>Computer Science Teaching Methodology</u></b>	40	-Lecture -Discussion -Group work	Internet, Books	Short question -Long question -Multiple Choice

### **Laboratory:**

There shall be 20 exercises in minimum, as decided by the faculty. The exercises shall encompass a broad spectrum of real-life and scientific problems, development of small program to the development of fairly complex subroutines, programs for practical applications and problem solving situations. Laboratory assignments will be offered in groups of two to four for evaluation purpose. In general, the Laboratory Work must cover assignments and exercises from the following areas:

1. Data types – control structures, functions and scoping rules.
2. Composite data types, C++ strings, use of " Constant " keyword, pointers and references
3. Classes and data abstraction
4. Inheritance, abstract classes and multiple inheritance
5. Friend functions, friend classes and operator overloading.
6. Static class members
7. Polymorphism, early binding and late binding
8. C++ type conversion
9. Exception handling
10. Function templates, class templates and container classes.

For database management system, there shall be 12 laboratory exercised based on database package to cover theoretical part studied. An individual project should be given to each student.

**Text Book:**

- 1 R. Lafore, *Object Oriented Programming in Turbo C++*, Galgotia Publications Ltd. India, 2001.
- 2 A.K Majumdar and P. Bhattacharaya, *Database Management Systems*, Tata McGraw Hill, India, 2003.

**Reference Books:**

1. Lippman, S.B., Lajoie. J., *C++ Primer*, 3<sup>rd</sup> Ed., Addison Wesley, 1998
2. Eckel, B., *Thinking in C++*, 2<sup>nd</sup> Edition, Prentice Hall, 2000
3. Budd, T., *An Introduction to Object Oriented Programming*, Second Edition, Addison-Wesley, Pearson Education Asia, ISBN: 81-7808-228-4.
4. Savitch, W, *Problem Solving with C++ - The Object of Programming*, 2<sup>nd</sup> Edition, Addison – Wesley, Pearson Education Asia (LPE), 2001, ISBN: 81-7808-173-3.
5. H.F. Korth and A. Silberschatz, *Database System Concepts*, McGraw Hill.
6. R.E. Mani and S.C Nevathe, *Fundamentals of Database Systems*, Benjamin/Cummings Publishing Co. Inc.
7. G.C Everest, *Database Management*, McGraw Hill.