**Unit 1: Advanced SQL [9]**

* Controlling the program flow, conditional statements, loops
* Views
* Stored Functions
* Stored Procedures
* Handling errors and exceptions
* Cursors
* Triggers

**Unit 2: Transactions and concurrency control mechanism [9]**

* Describe a transaction, properties of transaction, state of the transaction.
* Executing transactions concurrently associated problem in concurrent execution.
* Schedules - types of schedules
* Concept of Serializability
* Precedence graph for Serializability
* Ensuring Serializability by locks, different lock modes, 2PL and its variations.
* Basic timestamp method for concurrency, Thomas Write Rule.
* Locks with multiple granularity, dynamic database concurrency (Phantom Problem).
* Timestamps versus locking
* Deadlock handling methods - Detection and Recovery (Wait for graph).
* Prevention algorithms (Wound-wait, Wait-die)

**Unit 3: Database Integrity and Security Concepts [8]**

* Domain constraints
* Referential Integrity
* Introduction to database security concepts
* Methods for database security
* Discretionary access control method
* Mandatory access control
* Role base access control for multilevel security
* Use of views in security enforcement
* Overview of encryption technique for security
* Statistical database security

**Unit 4: Crash Recovery [7]**

* Failure classification
* Recovery concepts
* Log base recovery techniques (Deferred and Immediate update)
* Checkpoints
* Recovery with concurrent transactions (Rollback, checkpoints, commit)