Course: BTech   **Semester:** 3

Prerequisite: Basic Computer Knowledge

Course Objective: The course will enable students to understand the different issues involved in the design and implementation of a database system as well execute various database queries using SQL.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	0	0	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , T - Teaching hours

Sr.	Topics	W	T
1	**Introduction:** Introduction and applications of DBMS, File Processing System and its limitations, ANSI/SPARC Model, Data Independence, Client-Server Architecture, Users & DBA, Database Architecture.	10	3
2	**SQL:** Data Definition Language (DDL) commands, Data Manipulation Language (DML) commands, Data Control Language (DCL) commands, Transaction Control Language (TCL) commands. **Predicates & Clauses:** Logical Operators (AND / OR), Relational Operators, BETWEEN Predicate, IN & NOT IN Predicate, LIKE Predicate. **Functions in SQL**: Aggregate Functions, Character Functions, Arithmetic Functions, Date Functions, Conversion Functions.	10	4
3	**Data Models:** Hierarchical Model, Network Model, Relational Model, Object Oriented Model. **E-R Diagram:** Introduction to E-R Diagram, Entities, Attributes & its types, Relationships, Mapping Cardinalities, Participation Constraints, Weak Entity Sets, Specialization, Generalization, Aggregation.	10	5
4	**Relational Data Model:** **Relational Data Model:** Introduction, Degree, Cardinality. **Constraints & Keys:** Primary Key, Foreign Key, Super Key, Candidate Key, Not Null Constraint, Check Constraint. **Relational Algebra Operations:** Selection, Projection, Cross-Product, Rename, Joins (Natural & Outer Join), Set Operators (Union, Intersection, Set Difference), Aggregate Functions.	10	4
5	**Relational Database Design:** Functional Dependency – definition, trivial and non-trivial FD, Armstrong's Axioms/Inference Rules, Closure of FD, Closure of Attributes, Candidate Key, Finding a Candidate Key, Decomposition (Lossy & Lossless), Database Anomalies, Normalization – 1Nf, 2NF, 3NF, BCNF, 4NF, 5NF	20	6
6	**Transaction:** **Transaction:** Introduction, ACID Properties, Transaction Life Cycle, Scheduling, Serial Schedule, Interleaved Schedule, Transaction Operations, Serializability (View & Conflict), Two-Phase Commit Protocol. **Database Recovery:** Introduction, Log Based Recovery, Shadow Paging, Checkpoints. **Concurrency Control:** Introduction, Lock Based Protocol, Two Phase Lock Protocol, Intention Locking, Multiple Granularity, Time-based Protocol. **Deadlock:** Introduction, Deadlock Detection, Deadlock Recovery, Deadlock Prevention (Wait-Die, Wound-Wait & Timeout-Based Approach).	20	12
7	**Query Processing:** **Query Processing:** Introduction, Layers of Query Processing, Measures of Query Cost, File Scans (Linear & Binary Search), Materialized View, Pipelining. **Query Optimization:** Introduction, Equivalence Rules, Cost-Based Query Optimization.	10	3
8	**Security:**	5	2

	Security: Data Security, Data Integrity, Authentication, Authorization, Encryption, Decryption, Access Control (DAC, RBAC, MAC), Intrusion Detection, SQL Injection		
9	**PL/SQL Concepts:**Views, PL/SQL Block, Cursors, Triggers, Stored Procedures, Store Functions	5	3

Reference Books

1.	**Database System Concepts (TextBook)**
	By Abraham Silberschatz, Henry Korth, S. Sudarshan | McGraw Hill International | 6th Edition
2.	**An Introduction to Database Systems**
	By C. J. Date, A. Kannan, S. Swamynathan | Pearson Education | 8th Edition
3.	**SQL, PL/SQL – The Programming Language**
	By Ivan Bayross | BPB Publications

Course Outcome

After Learning the Course the students shall be able to:

After Learning the Course the students shall be able to:
1. Understand basic concepts of Database.
2. Understand Relational Models and its importance.
3. Build proper structured database for a given problem or application.
4. Learn how various transactions are managed in real-time scenarios.
5. Understand the evaluation parameters of a query as well as security parameters of database.
6. Implement SQL concepts to build dynamic database applications.

Miscellaneous

Exam Requirement

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.