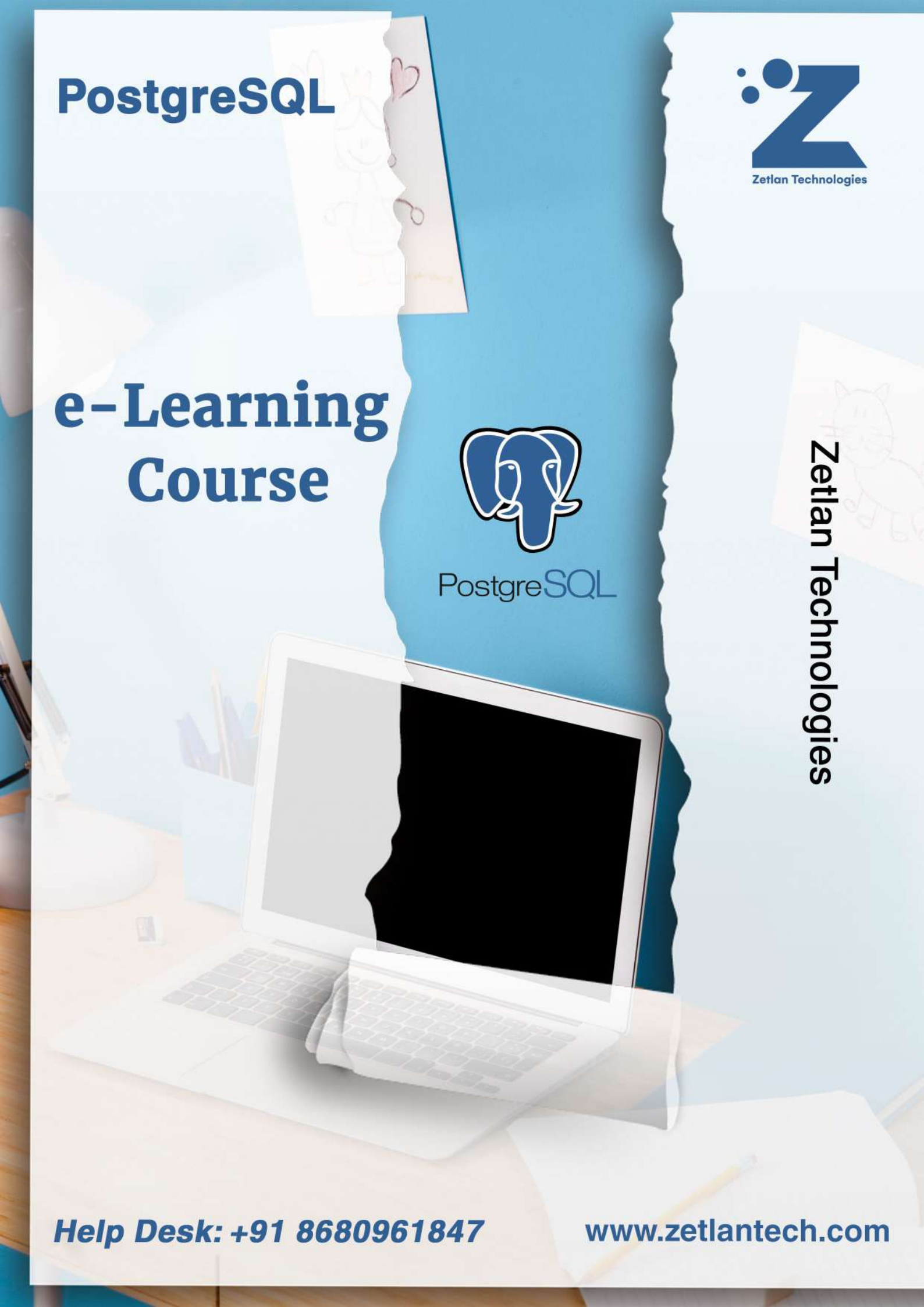
PostgreSQL

Zetlan Technologies

e-Learning Course



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COURSE MODULES

Module 1: Introduction to PostgreSQL

- Overview of PostgreSQL
- Features & advantages
- Installing PostgreSQL (Windows, macOS, Linux)
- PostgreSQL architecture
- Understanding psql (PostgreSQL command-line tool)

Module 2: Basic SQL with PostgreSQL

- Database creation & management
- Data types in PostgreSQL
- Tables: Creating, Modifying, and Dropping
- Inserting, Updating, and Deleting data
- Querying data with SELECT
- Filtering with WHERE, ORDER BY, and LIMIT
- Using DISTINCT, GROUP BY, and HAVING
- Working with NULL values

Module 3: Advanced SQL Queries

- Joins: INNER, LEFT, RIGHT, FULL
- Subqueries & Common Table Expressions (CTEs)
- Window functions (ROW_NUMBER(), RANK(), DENSE_RANK(), etc.)
- Aggregate functions (COUNT(), SUM(), AVG(), etc.)
- String functions (CONCAT(), SUBSTRING(), LOWER(), UPPER())
- Date & time functions
- CASE statements and conditional expressions

Module 4: PostgreSQL Constraints & Indexing

- Primary & Foreign Keys
- UNIQUE and CHECK Constraints
- DEFAULT and NOT NULL Constraints
- Indexes: B-Tree, Hash, GIN, BRIN
- Performance optimization using indexes

Module 5: Data Modeling & Relationships

- One-to-One, One-to-Many, Many-to-Many relationships
- Normalization & Denormalization
- Using Foreign Keys for relational integrity
- Working with JSON & JSONB data types

Module 6: PostgreSQL Functions & Stored Procedures

- Creating user-defined functions
- PL/pgSQL functions vs SQL functions
- Writing and using stored procedures
- Error handling and exception handling in functions

Module 7: PostgreSQL Views & Triggers

- Creating and managing views
- Materialized views
- Using triggers for automation
- Creating trigger functions in PL/pgSQL

Module 8: Transactions & Concurrency Control

- Understanding ACID properties
- Transactions: BEGIN, COMMIT, ROLLBACK
- Savepoints in transactions
- Isolation levels (READ COMMITTED, SERIALIZABLE, etc.)
- Deadlocks and how to avoid them

Module 9: Performance Tuning & Optimization

- Query execution plans (EXPLAIN and EXPLAIN ANALYZE)
- Otimizing queries using indexes
- Prtitioning tables for better performance
- Vacuuming & Analyzing database
- Connection pooling & optimizing memory usage

Module 10: PostgreSQL Security

- User roles & privileges
- Granting & revoking permissions
- Securing database connections (SSL/TLS)
- Auditing & logging user activities

Module 11: Backup & Recovery

- Creating and restoring database backups (pg_dump, pg_restore)
- Using pg_basebackup for physical backups
- Point-in-time recovery (PITR)
- Replication & High Availability

Module 12: Working with PostgreSQL in Applications

- Connecting PostgreSQL with Python (psycopg2)
- Using PostgreSQL with Node.js, Java, and other languages
- ORMs like SQLAlchemy (Python) and TypeORM (Node.js)
- Using PostgreSQL in a Docker container