

## PostgreSQL Basics

**Duration: 2 Days**    **Course Code: GK840202**    **Delivery Method: Closed Events**

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### Overview:

**Learn the essentials of PostgreSQL and enhance your database management skills.**

PostgreSQL Basics provides a solid foundation in PostgreSQL, a powerful open-source relational database system. You'll learn how to install, configure, and manage PostgreSQL in a development environment. The course covers essential topics such as working with different data types, writing SQL queries, designing efficient database schemas, and optimizing query performance. Additionally, you'll explore transaction management, user and role management, and basic security policies to ensure data integrity and security. By the end of the course, you'll have the skills to effectively manage PostgreSQL databases and perform fundamental backup and restore operations. The course combines theoretical knowledge with practical exercises, ensuring you can apply what you learn in real-world scenarios. Join us to unlock the full potential of PostgreSQL and enhance your database management skills.

### Company Events

These events can be delivered exclusively for your company at our locations or yours, specifically for your delegates and your needs. The Company Events can be tailored or standard course deliveries.

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### Target Audience:

- Software developers
  - Data scientists
  - System administrators
  - Technical professionals.
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### Objectives:

- Install and configure PostgreSQL in a development environment
  - Select and implement fundamental data types including numeric, character, and date/time types
  - Write essential SQL queries using basic joins, filtering, and aggregations
  - Design normalized database schemas and implement key constraints for data integrity
  - Understand and implement B-tree indexes to optimize common query patterns
  - Manage basic transactions and understand isolation levels
  - Execute concurrent operations safely using proper transaction management
  - Create and manage users and roles with appropriate privileges using GRANT/REVOKE
  - Implement basic security policies and access controls
  - Perform fundamental backup and restore operations
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### Prerequisites:

- Foundational knowledge of databases, operating systems, networking, and programming
  - GK3150 - Understanding Networking Fundamentals (Network+)
  - GK840203 - Introduction to Programming
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## Content:

Introduction to PostgreSQL overview, key features, and benefits	Basic Filtering using WHERE	EXPLAIN, its output components: (Node Type, Relation, Filter, Cost, Rows, Width)
Installation and Configuration	Comparison Operators (=, !=, >, <, >=, <=)	EXPLAIN ANALYZE
Installing PostgreSQL on Windows/ Mac	Logical Operators(AND, OR, NOT)	Identifying common query issues (Sequential Scans on Large Tables, Missing or Inefficient Indexes, Cost estimation.)
Using package managers for Linux/Mac.	Pattern Matching with LIKE	Query optimization techniques (Efficient query design, Index Optimization, Reducing Query complexity, autovacuum process )
Install and Configure PostgreSQL Tools(pgAdmin,psql)	Range Filtering with BETWEEN	Monitoring and Troubleshooting Query Performance(Using Explain and Logs, Real-time Monitoring tools, Fixing performance issues)
Verify installation: connect using psql , run basic command	NULL Handling	Transaction Management
Modify postgresql.conf Essential settings(Memory, logging, connection)	JOIN Operations (INNER JOIN, LEFT JOIN)	Transaction Basics (ACID): (ACID properties, real world examples of Transactions)
Modify Settings directly, or use ALTER SYSTEM	Basic Aggregations (COUNT, SUM, AVG, MIN, MAX)	Transaction life-cycle and control(Life cycle, Transaction control using BEGIN, COMMIT, ROLLBACK, savepoints)
File Locations: Typical file paths for different OS (Linux, Windows, macOS (SHOW config_file; or SHOW hba_file).	Grouping results with GROUP BY and HAVING clause	common errors in transaction management
Adjust Connection Settings for remote access: listen_addresses parameter, Network Security Considerations	Data modification: INSERT, UPDATE, DELETE Operations	Transaction Isolation Levels(Introduction, Levels of isolation, Trade-offs in Isolation Levels, Example scenarios)
Client Authentication Configuration: pg_hba.conf structure and syntax, Supported authentication methods(Trust, md5, peer)	Database Design Principles	Handling Concurrent Access(concurrency control, Locks, Optimistic vs. Pessimistic Concurrency Control, Serializable transactions)
Data Types and Table Basics	Database design concepts	Deadlock Prevention and Resolution(Deadlock basics, deadlock detection, Deadlock Prevention Strategies)
Numeric Types (Integer Types(int, bigint, smallint), Decimal Types(decimal, numeric, float), Serial Type(serial, bigserial))	Normalization task (1NF, 2NF, 3NF)	Security Implementation
Character Types (char, varchar, text)	Normalization example	User and Role Management: ( 1. User and role concepts, 2. Creating, altering and dropping users and roles, 3. Managing role membership)
Date/Time Types (DATE, TIME, TimestamP, INTERVAL,Common Operations, Time Zone Handling)	Tade off of denormalization	
Boolean Type(TRUE, FALSE, NULL)	Primary Key Selection for ensuring row uniqueness	
	Foreign Key Implementation for maintaining referential integrity, Examples of foreign key constraints: ON DELETE CASCADE and ON UPDATE CASCADE	
	Table Relationships (one-to-one, one-to-many, many-to-many)	
	Constraint Types and Usage( NOT NULL,	

Arrays: definition and syntax	UNIQUE, CHECK, DEFAULT, Primary key, and foreign key)	GRANT and REVOKE Operations:
Custom data types	Schema Organization(What is a Schema?, Benefits of Schema Organization: Logical grouping, Security and access control, Better organization in large systems, Easier maintenance)	Role of GRANT and REVOKE (1. GRANT, 2. REVOKE, 3.Permission types)
JSON data type		Syntax for Granting and Revoking Privileges
Using PostgreSQL for vector storage	Indexing and Performance	Checking current privileges
Creating Tables (CREATE TABLE), Modifying table(ALTER TABLE), Dropping tables (DROP TABLE, CASCADE)	Indexing fundamental( B-Tree indexes(Definition, Structure, Search Mechanism, why use B-trees?), other index types(HASH, JIN, BRIN,GiST))	Auditing privileges
SQL Fundamentals		Principle of least privilege
SELECT Statement Essentials: (SELECT syntax, using DISTINCT to remove duplicates, using AS to rename columns or tables)	When to create indexes (frequent use in WHERE, JOIN, ORDER BY, GROUP BY, high cardinality, covering indexes, composite indexes, large tables	Schema Permissions(Schema-level permissions, restricting access to sensitive data, Managing access to Schema Objects)
WHERE Clause and Filtering(basic filtering with WHERE,	When not to create indexes? (small tables, Frequent writes, columns with low cardinality, columns with sparse usage)	Object Privileges(Object types and privileges, GRANT and REVOKE for object-level access)
	Query Performance Analysis(Introduction)	Password Policies(password complexity requirements, password expiration policies, user authentication methods)
		<ul style="list-style-type: none"> <li>Basic Backup and Recovery(Importance of Backups, Backup types (Logical vs. Physical), tools for automating backups, Restoring from backups)</li> </ul>

## Further Information:

For More information, or to book your course, please call us on 00 966 92000 9278

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