



**POSTGRES
WOMEN
INDIA**

Postgres Women India Upskill Program

PostgreSQL Database Administration Training Curriculum (16 Weeks)

| Weeks | Session Title | Topic |
|--------|---|---|
| Week 0 | Kick-off session | Program Overview and Logistics setup |
| Week 1 | Introduction & Installation | PostgreSQL overview, installation & basics |
| Week 2 | Database Design & Schema Management | Data types, schema design, and indexing |
| Week 3 | Re-Introducing PostgreSQL Architecture & Parameters | Deep dive into architecture and parameters |
| Week 4 | Advanced SQL & PL/pgSQL | Advanced queries, PL/pgSQL |
| Week 5 | Backup & Restore | Backup strategies and restore procedures |
| Week 6 | Performance Tuning & Optimization 1 | Query optimization and PostgreSQL tuning basics |
| Week 7 | Tuning & Optimization 2 | Resource management and connection pooling |



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| Week 8 | Table Partitioning | Partitioning strategies |
| Week 9 | Security | User-management, access control, encryption |
| Week 10 | High Availability | Failover, switchover and HA tools |
| Week 11 | Replication | Streaming replications & management |
| Week 12 | Monitoring & Maintenance | Monitoring tools, VACUUM and bloat management |
| Week 13 | Introduction to Database Migration | Migration considerations and tools |
| Week 14 | Advanced Topics | Full-text search, advanced partitioning |
| Week 15 | Extensions & Customization | Extensions and custom configurations |
| Week 16 | AMA Session | Open discussions and insights |

Week 0 - Training Pre-requisites

Logistics Setup

- Arrange for a laptop/desktop with Webcam & internet connection
- Install Google Meet, any VM software (for Windows users)
- Access to any Linux distribution OS, like Rocky/Ubuntu/etc.
- Gain basic knowledge of the Linux Operating system



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Week 1: Introduction and Installation

Overview of PostgreSQL

- Introduction to PostgreSQL
- History and features
- Use cases and advantages

Installation

- Installing PostgreSQL on different operating systems (preferably Linux)
- Initial configuration and setup
- Exploring the PostgreSQL directory structure

PostgreSQL Architecture

- Understanding PostgreSQL components
- PostgreSQL process architecture
- Memory management

Basic SQL Commands

- Introduction to SQL
- Basic SQL commands (SELECT, INSERT, UPDATE, DELETE)
- Quiz - 15 minutes
- Hands-on exercises

Week 2: Database Design and Schema Management

Data Types and Tables

- PostgreSQL data types
- Creating and managing tables
- Constraints (Primary Key, Foreign Key, Unique, Check)

Indexing

- Importance of indexing



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- Types of indexes
- Creating and managing indexes

Database Schema Design

- Normalization and denormalization
- Best practices for schema design
- Hands-on exercises

Week 3: Re-Introducing PostgreSQL Architecture and Parameters

PostgreSQL Architecture

- Architecture components
- PostgreSQL process model
- Memory management
- Storage management
- System catalog

Parameters in PostgreSQL

- Configuration files
- Key parameters and their importance
- Parameter tuning
- Quiz - 15 minutes

Week 4: Advanced SQL and PL/pgSQL

Advanced SQL

- Joins, subqueries, and common table expressions (CTEs)
- Window functions

PL/pgSQL

- Introduction to PL/pgSQL
- Creating and using functions and procedures



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- Triggers and event-driven programming

Hands-on Lab

- Practical exercises and real-world scenarios

Week 5: Backup and Restore

Backup Strategies

- Importance of backups
- Types of backups (Logical, Physical)
- Tools for backup (pg_dump, pg_basebackup)

Restore Procedures

- Restoring from logical backups
- Restoring from physical backups
- Point-in-time recovery (PITR)

Hands-on Lab

- Backup and restore exercises
- Quiz - 15 minutes

Week 6 & 7 : Performance Tuning and Optimization

Query Optimization

- Understanding query execution plans
- Using EXPLAIN and ANALYZE
- Query optimization techniques

Database Performance

- Tuning PostgreSQL configuration parameters
- Managing resources (CPU, memory, I/O)
- Connection pooling

Hands-on Lab



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- Performance tuning exercises
- Quiz - 15 minutes

Week 8: Table Partitioning

- Introduction to table partitioning
- Benefits and use cases for partitioning
- Implementing partitioning strategies (range, list, hash)
- Hands-on lab with real-world scenarios
- Quiz - 15 minutes

Week 9: Security

User Management

- Creating and managing users and roles
- Authentication methods

Access Control

- Implementing access control with GRANT and REVOKE
- Row-level security (RLS)

Data Encryption

- Encrypting data at rest and in transit
- Configuring SSL
- Hands-on exercises
- Quiz - 15 minutes

Week 10: High Availability

High Availability

- Introduction to high availability



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- Failover and switchover strategies
- Tools for high availability (Patroni, repmgr)

Hands-on Lab

- High-availability exercises with Cloud/On-prem systems
- Quiz - 15 minutes

Week 11: Replication

Replication

- Introduction to replication
- Setting up streaming replication
- Monitoring and managing replication

Hands-on Lab

- high-availability exercises
- Quiz - 15 minutes

Week 12: Monitoring and Maintenance

Monitoring

- Monitoring tools and techniques
- Using `pg_stat_statements` and `pgBadger`
- Setting up alerts and notifications

Maintenance

- Routine maintenance tasks (`VACUUM`, `ANALYZE`)
- Managing bloat and fragmentation

Hands-on Lab

- Monitoring and maintenance exercises
- Quiz - 15 minutes



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Week 13: Introduction to Database Migration

Core Agenda

- Why Migration to PostgreSQL is the need of hour.
- Important considerations in Migration.
- Tools to support both Homogeneous and Heterogeneous migration.
- Logical Replications and its considerations.
- Tools Overview to enable Migrations.

Week 14: Advanced Topics

Partitioning

- Introduction to table partitioning
- Implementing partitioning strategies

Full-Text Search

- Setting up full-text search
- Using tsearch2 and GIN indexes

Hands-on Lab

- Advanced topic exercises

Week 15: Extensions and Customization

PostgreSQL Extensions

- Popular extensions (PostGIS, hstore, pg_cron)
- Installing and managing extensions

Customization

- Customizing PostgreSQL configuration



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- Writing custom extensions

Hands-on Lab

- Extension and customization exercises
- Quiz - 15 minutes

Week 16: AMI Session

- Open discussions
- Questions and insights

