MD-05: Advanced Database Engineering

Beyond CRUD - Build Database Systems That Scale Under Pressure

Database administrators and architects held 144,900 jobs in 2024. PostgreSQL is the most admired database among professional developers. This 6-week module adds the missing layer most developers never learn: query plans, schema design, caching strategy, replication, and polyglot persistence. Every backend role increasingly requires this depth - and very few training programs teach it properly.

The focus is on engineering judgment, not memorizing vendor trivia.

Why This Course?

The Market Reality

Global Context: As applications scale, database performance, schema decisions, and reliability become business-critical. Teams increasingly need engineers who can reason about query plans, indexing, transactions, replication, and storage trade-offs - not just CRUD queries.

Nepal Context: Nepal's fintech sector (F1Soft, eSewa, Khalti, IME Pay) handles millions of daily transactions requiring robust database architecture. E-commerce platforms, health-tech systems, and government digital services in Nepal are scaling rapidly, creating demand for engineers who understand indexing, replication, sharding, and query optimization at depth. Database engineering is consistently one of the hardest skills for Nepali tech companies to hire for.

Your Opportunity: This course positions you for **database engineer, backend architect, and data platform roles** - the foundational layer every system depends on.

Nepal-Relevant Reality	Opportunity
F1Soft, eSewa, Khalti handle millions of daily transactions	Critical database skills needed locally
E-commerce and fintech scaling rapidly	Performance engineering in high demand
Government digital services expanding	Public-sector database opportunities
Hardest skill for Nepali companies to hire	Premium compensation for database expertise

Course Snapshot

Parameter	Details
Course Code	MD-05
Title	Advanced Database Engineering
Duration	1.5 Months (6 Weeks)
Schedule	Monday to Friday (Mon–Fri, 5 Days/Week), 2 Hours/Day
Total Hours	60 Hours of Live Training
Batch Size	Maximum 10 Students
Course Fee	NPR 22,000
Prerequisites	Comfortable with CRUD, joins, and normal application-side database usage. Saarathi Gate Assessment (diagnostic, no pass/fail) before Day 1.
Self-Study	Minimum 2 hours/day outside class (mandatory)
Outcome	Database Engineer / Data-Focused Backend Engineer

Your Learning Week

Day	Activity
Mon–Fri	2-hour live class session (hands-on, query-classroom-based)
Mon–Fri	Minimum 2 hours self-study & database practice (mandatory)
Saturday	No classes - flexible self-study, peer collaboration, tuning practice
Sunday	Whole day self-learn time. Classrooms remain fully open for you to come in, study, collaborate with peers, and build projects. (Highly recommended for networking!)

> *Every student MUST spend at least 2 dedicated hours a day on focused database practice beyond the classroom at home. This is non-negotiable for success, it is what separates graduates who get hired from those who don't.*

Week-by-Week Curriculum

Phase 1: PostgreSQL Performance & Production Habits (Weeks 1–3, 3 Weeks, 30 Hours)

Week	Focus Area	What You'll Master
Week 1	Database Foundations Refresh & Classroom Environment Setup	Database fundamentals refresher, SQL recap, PostgreSQL setup, classroom environment configuration
Week 2	PostgreSQL Architecture	Partitioning, replication, WAL, connection pooling, operational trade-offs
Week 3	PostgreSQL Project Week	Reporting patterns, search, multi-tenant structures, production review

Phase 2: MongoDB, Redis & Polyglot Persistence (Weeks 4–6, 3 Weeks, 30 Hours)

Week	Focus Area	What You'll Master
Week 4	MongoDB Design	Document modeling, aggregation, indexing, transactions, read patterns
Week 5	Redis in Production	Caching, invalidation, streams, pub/sub, coordination use cases
Week 6	Polyglot Persistence & Capstone	Database selection, combined architecture, monitoring, final design rationale

Skills You'll Gain

Database Technologies

Technology	Proficiency Level
PostgreSQL	Performance Tuning & Architecture
MongoDB	Document Modeling & Aggregation
Redis	Caching & Real-time Patterns
SQL	Advanced Query Optimization

Technology	Proficiency Level
pgAdmin / psql	Database Administration
Monitoring Tools	Performance Observability

Engineering Skills

Skill	Application
Query Plan Analysis	Understanding and optimizing execution
Schema Design	Normalization, denormalization, and trade-offs
Replication & Sharding	Distributed data architecture
Cache Strategy	Multi-layer caching and invalidation

Topic Depth and Awareness

Section	Guidance
Purpose	This course intentionally separates what you need to master in depth from what you only need to understand with working awareness.
Depth	The query-analysis, schema-design, caching, and database-decision workflows practiced repeatedly in class The execution areas you are expected to perform independently in advanced database work The performance and trade-off habits most likely to matter in backend architecture decisions
Awareness	Adjacent tools, optional stretch topics, and industry context introduced for broader understanding Concepts you should be able to explain, compare, and recognize even if you are not yet executing them independently Advanced directions for later specialization, higher-level tracks, or guided self-study
How to use this syllabus	Spend most of your self-study time strengthening the depth topics first. Treat awareness topics as context builders that help you make better decisions and understand the larger professional landscape.

Project Pool

> *All options below are **intermediate-level final projects**. Each student chooses **one** final project from this pool. Trainers may run smaller guided exercises during the course, but public phase-wise project sections are intentionally removed so the completion standard stays clear and consistent.*

#	Final Project Choice	What You Will Build	Core Stack / Tools
1	PostgreSQL Performance Audit	Audit slow queries, indexes, plans, and schema choices for a realistic production-style workload.	PostgreSQL, EXPLAIN ANALYZE, index tuning, query plans
2	Multi-Tenant Data Model Pack	Compare and implement multi-tenant isolation patterns with clear trade-offs and operational notes.	PostgreSQL, Row-Level Security, schema design, tenant isolation
3	MongoDB + Redis Realtime Architecture	Design a document-store plus cache architecture for fast reads, sessions, and event-driven updates.	MongoDB, Redis, cache invalidation, real-time access patterns
4	Analytics Warehouse Modeling Pack	Model an analytics-ready schema for reporting, summarization, and data-access clarity.	SQL modeling, fact / dimension design, reporting queries, data governance
5	Time-Series Data Platform Plan	Design a time-series storage and querying approach with retention, compression, and operational guardrails.	TimescaleDB / ClickHouse awareness, partitioning, retention policy, query tuning

Career Paths & Trajectory

Role Path	Focus and Proof	Stage and Timeline	What Actually Matters
Backend Developer (Data-Focused)	Improve schemas, queries, and migrations inside backend-heavy product work. Proof you leave with: EXPLAIN habits, index choices, and stronger schema reasoning	Immediate skill-up path - first 0–12 months	Query discipline, correct constraints, and thinking about workload before adding complexity.

Role Path	Focus and Proof	Stage and Timeline	What Actually Matters
Database-Focused Backend Engineer	Own performance tuning, caching choices, and operational database changes for a service. Proof you leave with: Query-plan analysis, caching patterns, and replication awareness	Growth role - 1–3 years	Careful benchmarking, safer migrations, and debugging slow queries methodically.
Database Engineer / DBA	Support reliability, backups, replication, and production troubleshooting across critical systems. Proof you leave with: PgBouncer, backup and replica setup, and monitoring evidence	Specialist path - 3–5 years	Production calm, data-layer incident handling, and balancing performance with correctness.
Senior Database Engineer / Data Platform Engineer	Guide storage design, cross-service data standards, and long-term database decisions. Proof you leave with: Polyglot architecture memo, monitoring design, and trade-off judgment	Senior path - 5+ years	Strong judgment on storage boundaries, migration risk, and long-term maintainability.

Saarathi Gate & Completion Review

Before You Start: Saarathi Gate Assessment

All students complete the **Saarathi Gate Assessment** before Day 1. It is a short diagnostic review of aptitude, learning behaviour, and thinking style. It has **no pass/fail** and is used only to tailor support from the start.

After Course Completion: Saarathi Completion Review

The **Saarathi Academy Certificate** is issued after the selected final project is completed, documented, and reviewed by the trainer. There is **no separate certification exam** for this course.

Completion Requirements:

1. **Attendance:** Minimum 80% attendance
2. **Weekly Work:** Core deliverables, revision work, and practice tasks completed
3. **Final Project:** One intermediate-level project selected from the project pool and completed to trainer-approved quality

4. **Portfolio Proof:** Screenshots, documentation, case-study notes, or equivalent proof assets updated
5. **Trainer Review:** Practical execution, consistency, communication, and overall growth signed off by the trainer

Enrollment & Next Steps

Next Batch: Starting soon (contact for exact dates) **Offline Location:** Old Baneshwor Chowk, Kathmandu, Nepal **Mode:** Online + Offline **Contact (Call/WhatsApp):** 9761095364, 9744442469

>> [ENROLL NOW] - Limited to 10 seats per batch

Every application sits on a database. In 6 weeks, you will understand what's happening underneath - and know how to make it better.

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