



Master Roadmap — Database Systems (End-to-End)

This roadmap shows **all 22 phases**, their **dependencies**, and the **progression from foundations → internals → distributed → analytics → emerging technologies**.



Level 1 — Foundations (Must-learn Basics)

- Phase 1 → Foundations of Databases
- Phase 2 → Data Modeling & ERD
- Phase 3 → Relational Model & Constraints
- Phase 4 → Relational Algebra
- Phase 4.5 → Data Types & Storage Formats



These phases build conceptual correctness before SQL or performance topics.



- Phase 5 → SQL Basics
- Phase 6 → Intermediate SQL
- Phase 7 → Normalization Theory



You now understand how to design clean schemas and write correct queries.



- Phase 8 → Indexing & Query Optimization
- Phase 9 → Transactions, Concurrency & Locking
- Phase 10 → Storage Engines & DB Architecture



This level explains HOW databases actually work internally.



Level 4 — Server-side Logic & Security

Phase 11 → Stored Procedures, Triggers & Cursors
Phase 12 → Database Security



Enterprise-grade database usage and protection.



Level 5 — Non-Relational & Scalability

Phase 13 → NoSQL & Modern Data Systems
Phase 14 → High Availability & Replication



Beyond single-node relational databases.



Level 6 — Analytics & Decision Systems

Phase 15 → Data Warehousing & OLAP



Databases for reporting, BI, and analytics.



Level 7 — Recovery & Fault Tolerance

Phase 16 → Database Recovery Techniques



Guaranteeing durability and crash recovery.



Level 8 — Distributed Databases

Phase 17 → Distributed Databases & Client-Server Architecture



Coordination, distribution, and multi-node systems.

Level 9 — Extended & Object-Oriented Databases

Phase 18 → Object-Relational & Extended-Relational Systems
Phase 19 → Object Database Standards & Design

 *Extending relational systems with complex data & objects.*

Level 10 — Semi-Structured & Web Data

Phase 20 → XML & Internet Databases

 *Bridges traditional DBs with web and semi-structured data.*

Level 11 — Analytics & Knowledge Discovery

Phase 21 → Data Mining Concepts

 *Extracting knowledge from large datasets.*

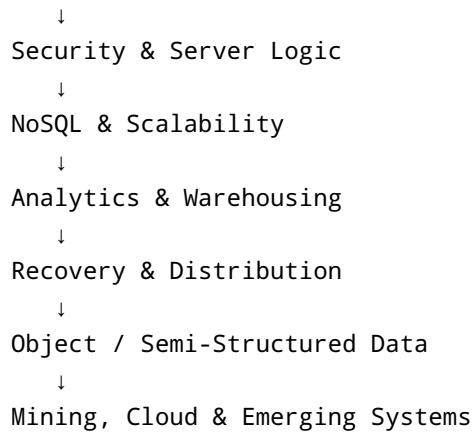
Level 12 — Modern & Emerging Technologies

Phase 22 → Emerging Database Technologies & Applications

Includes: - Mobile databases - GIS & multimedia databases - GraphQL & federated data access - Data Lake & Lakehouse - Cloud databases (RDS, Aurora) - Global distributed SQL (Spanner)

Dependency Summary (High-level Flow)

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graph TD; Foundations[Foundations] --> Modeling[Modeling & Theory]; Modeling --> SQL[SQL & Normalization]; SQL --> Performance[Performance & Internals]
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Final Outcome

By completing all **22 phases**, a learner can:

- Design correct and scalable schemas
- Optimize and debug slow queries
- Understand DB internals (storage, indexing, recovery)
- Build secure, transactional systems
- Scale databases across machines and regions
- Work with NoSQL, cloud, lakehouse, and modern data platforms

 This roadmap aligns with **CS-grade DBMS theory**, **enterprise databases**, and **modern cloud data engineering**.