Guide2Code - Database Management Systems (DBMS) Roadmap

🟢 Phase 1: Beginner Level

📚 Topics to Learn:

1. **Introduction to DBMS** (Need for Databases, File System vs DBMS)
2. **Database Models** (Hierarchical, Network, Relational, NoSQL)
3. **Relational Model & Keys** (Primary, Foreign, Candidate, Composite)
4. **SQL Basics** (DDL, DML, DCL, TCL)
5. **Normalization** (1NF, 2NF, 3NF, BCNF)
6. **ER Model & ER Diagrams** (Entities, Attributes, Relationships)
7. **Joins & Subqueries** (INNER, LEFT, RIGHT, SELF, Correlated Subqueries)
8. **Indexes & Views** (Types of Indexes, Materialized Views)
9. **Transactions & Concurrency Control** (ACID Properties, Locks, Deadlocks)
10. **Basic NoSQL Concepts** (Document, Key-Value, Column, Graph Databases)

🛠️ Beginner Project Ideas:

- **Student Database Management System** – Store and manage student records
- **Library Management System** – Track book inventory and users
- **Simple SQL Query Executor** – Build an interface for running SQL queries
- **Employee Payroll System** – Store employee details and salary info
- **E-commerce Product Catalog** – Manage product listings and categories

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🟡 Phase 2: Intermediate Level

📚 Topics to Learn:

1. **Advanced SQL Queries** (Window Functions, Common Table Expressions)
2. **Stored Procedures & Triggers** (Functions, PL/SQL, Cursors)
3. **Database Optimization** (Query Optimization, Index Tuning, Execution Plans)
4. **Concurrency & Recovery** (Isolation Levels, Two-Phase Locking, Crash Recovery)
5. **Distributed Databases** (CAP Theorem, Sharding, Replication)

6. **Big Data & NoSQL Databases** (MongoDB, Cassandra, Redis)
7. **Database Security** (Encryption, User Privileges, SQL Injection Prevention)
8. **Data Warehousing & OLAP** (Star & Snowflake Schema, Data Lakes)
9. **Cloud Databases** (AWS RDS, Firebase, Google Cloud SQL)
10. **Graph Databases** (Neo4j, Cypher Query Language)

🛠 **Intermediate Project Ideas:**

- **Hospital Management System** – Manage patient records and treatments
- **Banking System Simulation** – Handle transactions, accounts, and users
- **Flight Reservation System** – Book flights and manage schedules
- **Real-Time Chat Application Database** – Optimize for speed and scalability
- **Content Management System (CMS)** – Store and retrieve website content

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🔴 **Phase 3: Advanced Level**

📚 **Topics to Learn:**

1. **Advanced Database Indexing** (B-Trees, Hash Indexes, Bitmap Indexes)
2. **Data Mining & Business Intelligence** (Data Clustering, OLAP Cubes)
3. **Time-Series Databases** (InfluxDB, TimescaleDB, Log Analysis)
4. **Database Replication & Failover** (Master-Slave, Master-Master, Paxos)
5. **Graph Processing & Query Optimization** (GraphQL, Datalog)
6. **Blockchain & Decentralized Databases** (IPFS, BigchainDB)
7. **AI & ML in Databases** (Predictive Querying, Automated Indexing)
8. **High-Availability Architectures** (Fault-Tolerant DB Design)
9. **Parallel & Distributed Query Processing** (MapReduce, Apache Hive)
10. **Event-Driven Databases** (Kafka, Streaming Databases)

🛠 **Advanced Project Ideas:**

- **AI-Driven Query Optimizer** – Improve SQL query performance using ML
- **Blockchain-Based Secure Database** – Store immutable records using blockchain
- **Real-Time Analytics Dashboard** – Process and visualize large datasets

- **Geo-Spatial Database System** – Manage and query location-based data
- **Personalized Recommendation System** – Use graph databases for recommendations