🚀 Backend Engineer Roadmap

📌 Phase 1: Backend Fundamentals + Database (3 Months)

🎯 Focus

- HTTP, client–server architecture, REST API concepts
- SQL (PostgreSQL/MySQL):
  - Tables
  - JOINs
  - Transactions
  - Indexing
- Linux basics + Git workflow:
  - Branching
  - Merging
  - Pull Requests (PR)

🛠️ Project

👉 **Library Management System (REST API)**

- CRUD for:
  - Books
  - Users
  - Borrowing records
- Use PostgreSQL/MySQL
- Implement basic authentication:
  - Login & registration

📌 Phase 2: Backend with Python (3 Months) 🐍

🎯 Focus

- Python backend frameworks:
  - **FastAPI** (modern & async)
  - or **Django** (full framework)
- ORM:
  - SQLAlchemy / Django ORM
- Unit testing:
  - `pytest` / `unittest`
- Pagination & search APIs

🛠️ Project

👉 **Task Management API (Trello-lite)**

- Users can:
  - Create projects
  - Create tasks
  - Assign users to tasks
- Authentication using **JWT**

📌 Phase 3: Backend with Java (4 Months) ☕

🎯 Focus

- Spring Boot:
  - Controller
  - Service
  - Repository pattern
- ORM:
  - JPA / Hibernate
- Exception handling
- Validation
- DTO (Data Transfer Object)
- Testing:
  - JUnit
  - Mockito

🛠️ Project

👉 **E-commerce Backend**

- User CRUD + JWT authentication
- Product catalog & categories
- Shopping cart
- Checkout
- Order history
- Relational database with PostgreSQL

📌 Phase 4: Advanced Backend Concepts (3 Months) 🚀

🎯 Focus

- API design best practices

- Caching with **Redis**
- Asynchronous jobs:
  - Celery / RabbitMQ / Kafka (basic concepts)
- File upload:
  - AWS S3 / MinIO
- Security:
  - Rate limiting
  - Input validation
  - CORS
  - CSRF
  - TLS

🛠️ Project

👉 **Video Sharing Platform (Backend Only)**

- User uploads video metadata
- Async job to “process” videos (simulated transcoding)
- Redis caching for popular videos
- API rate limiting:
  - e.g. max **100 requests/hour/user**

📌 Phase 5: Deployment & DevOps (3 Months) 🐳

🎯 Focus

- Docker & Docker Compose
- Basic CI/CD:
  - GitHub Actions
- Cloud deployment:
  - AWS / GCP / Azure
  - or at least DigitalOcean

- Monitoring:
  - Logging (ELK stack) **or**
  - Prometheus + Grafana (basics)

🛠️ Project

👉 Deploy one previous project (e.g. **E-commerce Backend**) to the cloud:

- Publicly accessible API
- Cloud database
- Basic logging

📌 Phase 6: Capstone Project (2 Months) 🏆

🛠️ Large-Scale Project

👉 **Online Learning Platform (Backend System)**

- Multi-role system:
  - Admin
  - Instructor
  - Student
- Course CRUD:
  - Create, update, delete courses
- Payment simulation
- Video hosting:
  - AWS S3 / MinIO
- Caching for popular courses
- Notification system:
  - Email / queue
- Cloud deployment:
  - Dockerized
  - CI/CD enabled

⏳ Estimated Duration

- Phase 1 → 3 months
- Phase 2 → 3 months
- Phase 3 → 4 months
- Phase 4 → 3 months
- Phase 5 → 3 months
- Phase 6 (Capstone) → 2 months

Total: 18 months

🧠 Short Summary ✨

- Start with **fundamentals** (HTTP, SQL, Git, Linux)
- Learn **Python backend** (FastAPI/Django)
- Continue with **Java backend** (Spring Boot)
- Master **caching, async jobs, and security**
- Learn **deployment & DevOps**
- Finish with a **real-world capstone project**: Online Learning Platform

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💡 Prompts You Can Ask Next

- “Explain Phase 1 roadmap in detail with learning steps and small code examples”
- “Create a step-by-step Library Management System using Python/Java”
- “Explain how to deploy a backend project using Docker + GitHub Actions”