BackEnd Engineer RoadMap

🎓 1. Computer Science Fundamentals (Understanding core concepts that fuel the technology)

```
├── 💻 Basics of Computers & How They Work
├── 📊 Data Structures
├── 💡 Algorithms
├── 🌐 Networking Fundamentals
└── 🗄️ Database Fundamentals
```

🌍 2. Internet Basics (As a back-end engineer, understanding how the internet works is crucial)

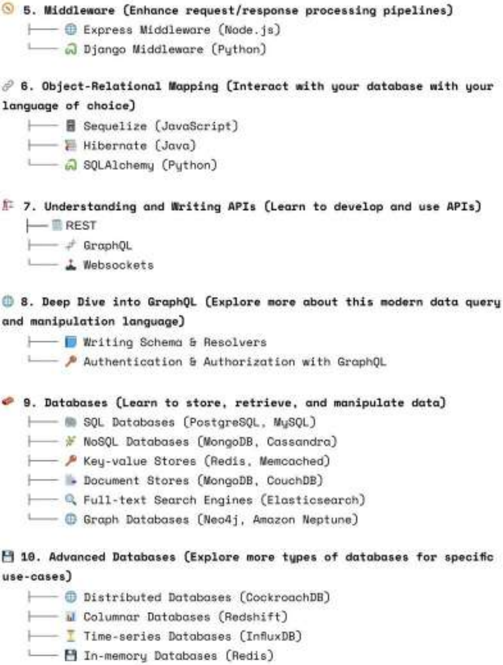
```
├── 🌐 Understanding How the Internet Works
├── 🚀 Basics of DNS & Hosting
├── 📦 HTTP/HTTPS & APIs
└── 📩 Email & SMTP
```

🔄 3. Version Control System (Manage and track changes to your code)

```
└── 🗂️ Git
    ├── 📝 Basic Commands
    ├── 🌿 Branching & Merging
    └──   Conflict Resolution
```

4. Programming Languages (Choose at least one, learn the syntax and principles)

├── 🐍 Python ├── 🟪 Node.js (JavaScript) ├── ☕ Java ├── 💎 Ruby ├── 🐘 PHP ├── 🦀 Rust └── 🥟 Go



```
⏱️ 5. Middleware (Enhance request/response processing pipelines)
    ├── 🌐 Express Middleware (Node.js)
    └── 🐍 Django Middleware (Python)

🔗 6. Object-Relational Mapping (Interact with your database with your
language of choice)
    ├── 🗄️ Sequelize (JavaScript)
    ├── 📚 Hibernate (Java)
    └── 🐍 SQLAlchemy (Python)

🏗️ 7. Understanding and Writing APIs (Learn to develop and use APIs)
    ├─ 🗒️ REST
    ├── 🔀 GraphQL
    └── 🕹️ Websockets

🌐 8. Deep Dive into GraphQL (Explore more about this modern data query
and manipulation language)
    ├── 📘 Writing Schema & Resolvers
    └── 🔑 Authentication & Authorization with GraphQL

🧱 9. Databases (Learn to store, retrieve, and manipulate data)
    ├── 📁 SQL Databases (PostgreSQL, MySQL)
    ├── 🌿 NoSQL Databases (MongoDB, Cassandra)
    ├── 🔑 Key-value Stores (Redis, Memcached)
    ├── 📑 Document Stores (MongoDB, CouchDB)
    ├── 🔍 Full-text Search Engines (Elasticsearch)
    └── 🌐 Graph Databases (Neo4j, Amazon Neptune)

💾 10. Advanced Databases (Explore more types of databases for specific
use-cases)
    ├── 🌐 Distributed Databases (CockroachDB)
    ├── 📊 Columnar Databases (Redshift)
    ├── ⏳ Time-series Databases (InfluxDB)
    └── 💾 In-memory Databases (Redis)
```

```
⚙️ 11. Learning about Servers (Understand and manage servers)
   ├── 🐧 Linux Basics and Command Line
   ├── 🧰 Server Configuration (nginx, Apache)
   ├── 🚀 Deployment (VPS providers: Digital Ocean, Linode, AWS EC2)
   ├── 🐳 Docker (Containerization)
   ├── 🍴 Kubernetes (Container Orchestration)
   └── ☁️ Cloud Providers (AWS, GCP, Azure)

🔐 12. Web Security Knowledge (Protect your application and data)
   ├── 🔒 HTTPS
   ├─🧱 CORS
   ├── 🛡️ OWASP Security Risks
   └─🌐 JWT

🧩 13. Backend Frameworks (Choose one based on your language of choice)
   ├── 🖼️ Django (Python)
   ├── 💠 Flask (Python)
   ├── 🔔 Express.js (Node.js)
   ├── 🚀 Spring Boot (Java)
   ├── 🏭 Rails (Ruby)
   └── 🛠️ Laravel (PHP)

🚀 14. Architectural Patterns (Learn to structure your applications)
   ├── 🕒 MVC Architecture
   ├── 📦 Microservices
   └── 🗄️ Serverless Architecture

✏️ 15. Testing (Ensure your application works as expected)
   ├── 📝 Unit Testing
   ├── 🔄 Integration Testing
   └── 🌐 End-to-End Testing
```

🛠 16. CI/CD (Automate the process from code to deployment)

├── 🔄 Continuous Integration
├── 🚀 Continuous Deployment
└── 🧰 Tools (Docker, Jenkins, GitHub Actions, GitLab)

🚀 17. Scalability and High Availability (Manage system growth efficiently)

├── 📈 Horizontal vs Vertical Scaling
├── ☁ Stateless Applications
├── 🛂 Redundancy & Failover Strategies
└── ⚖ Load Distribution

🔮 18. Service Mesh (Manage service-to-service communication in complex services)

├── 🌐 Istio
└── 🌐 Linkerd

🔀 19. API Design Principles and Best Practices (Create efficient, secure and user-friendly APIs)

└── 📜 RESTful API
Design └── 🌐 GraphQL
API Design

🏎 20. Performance (Ensure your services are fast and efficient)

├── 💬 Load Balancing
├── 🧠 Caching
├── 📈 Profiling
└── 🌐 Monitoring and Alerts (Prometheus, Grafana)

🧩 21. Advanced Topics (Delve deeper into back-end technologies and principles)

```
├── 🗄️ Message Brokers (RabbitMQ, Kafka)
├── 📅 Event-Driven Architecture
├── 🚀 Real-Time Communication (WebSockets, Server-Sent Events)
├── 🔐 Advanced Security (OAuth, OpenID, SAML, Encryption & Hashing)
├── 📈 Distributed Systems (Clustering, Sharding, Replication)
├── 🌐 Content Delivery Network (CDN)
├── 🏗️ Design Patterns (Singleton, Factory, Decorator, Observer, Module)
├──  Networking (TCP/IP, UDP, WebRTC)
└── 📖 DevOps Tools and Practices (Ansible, Chef, Puppet, Terraform, Monitoring, Logging)
```