Full syllabus of backend Development course

Backend Development Course Syllabus

Course Overview

This course is designed to provide a thorough understanding of backend development, including server-side programming, database management, API creation, security, and deployment.

Prerequisites

- Basic knowledge of programming
- Familiarity with web development concepts (HTML, CSS, JavaScript)

Course Modules

Module 1: Introduction to Backend Development

- Overview of Backend vs. Frontend Development
  - Roles and responsibilities of backend developers
  - Key differences and interactions between frontend and backend
- **Common Backend Languages and Frameworks**
  - Overview of popular languages: Python, JavaScript, Java, Ruby, PHP

Module 2: Programming Languages and Frameworks

- **Python**
  - Basics of Python
  - Flask/Django framework
- **JavaScript (Node.js)**
  - Introduction to Node.js
  - Express.js framework
- **Java**
  - Basics of Java
  - Spring Boot framework
- **Ruby**
  - Basics of Ruby
  - Ruby on Rails framework

- **PHP**
  - Basics of PHP
  - Laravel framework

Module 3: Databases

- **SQL Databases**
  - Introduction to SQL
  - PostgreSQL/MySQL basics
  - Advanced SQL queries and optimization
- **NoSQL Databases**
  - Introduction to NoSQL
  - MongoDB basics
  - Using NoSQL with applications
- **Database Design and Management**
  - Normalization
  - Indexing
  - Transactions

Module 4: Web Servers and Hosting

- **Web Servers**
  - Understanding web servers
  - Apache/Nginx basics
- **Hosting and Deployment**
  - Cloud platforms (AWS, Google Cloud, Azure)
  - Heroku and other PaaS
  - Docker and containerization

Module 5: RESTful and GraphQL APIs

- **API Basics**
  - What are APIs?
  - RESTful API principles
  - Introduction to GraphQL
- **Building APIs**
  - Creating RESTful APIs with Flask/Express.js/Spring Boot

  - Creating GraphQL APIs
  - API documentation (Swagger/OpenAPI)
- **API Security**
  - Authentication and authorization
  - JWT (JSON Web Tokens)
  - OAuth2

Module 6: Authentication and Authorization
- **User Authentication**
  - Session-based authentication
  - Token-based authentication
- **User Authorization**
  - Role-based access control (RBAC)
  - Implementing RBAC in applications
  - OAuth2 and OpenID Connect

Module 7: Middleware and Microservices
- **Understanding Middleware**
  - Types of middleware
  - Using middleware in Express.js/Spring Boot
- **Microservices**
  - Introduction to microservices
  - Designing and implementing microservices
  - Communication between microservices

Module 8: Testing and Debugging
- **Testing Basics**
  - Unit testing
  - Integration testing
- **Tools and Frameworks**
  - pytest (Python)
  - Mocha/Chai (Node.js)
  - JUnit (Java)
- **Debugging Techniques**

  - Using debuggers
  - Logging and monitoring
  - Handling errors and exceptions

Module 9: Performance Optimization
- **Performance Basics**
  - Identifying bottlenecks
  - Profiling applications
- **Optimization Techniques**
  - Caching strategies
  - Load balancing
  - Asynchronous programming
- **Scalability**
  - Vertical vs. horizontal scaling
  - Scaling databases and applications

Module 10: Security Best Practices
- **Security Fundamentals**
  - Common security vulnerabilities (OWASP Top 10)
  - Secure coding practices
- **Data Protection**
  - Encryption
  - Data privacy regulations (GDPR, CCPA)

Module 11: Advanced Topics
- **Event-Driven Architecture**
  - Introduction to event-driven systems
  - Using message brokers (RabbitMQ, Kafka)
- **Serverless Architecture**
  - Introduction to serverless computing
  - AWS Lambda, Google Cloud Functions
- **CI/CD**
  - Continuous Integration and Continuous Deployment
  - Tools and pipelines (Jenkins, GitHub Actions, Travis CI)

Projects and Assignments

- **Project 1**: Building a simple RESTful API
- **Project 2**: Creating a user authentication system
- **Project 3**: Developing a microservices-based application
- **Final Project**: Full-stack application with backend integration