

## Backend Development OA25BD01

### Beginner to Expert Course

#### Course Description

Become a proficient backend developer with this comprehensive course, covering server-side programming, databases, APIs, and deployment. Learn to build scalable and secure backend systems using Node.js, Express, and modern frameworks like NestJS. Designed for all skill levels, this course is ideal for creating robust server-side applications in 2025.

#### What You'll Learn

- Build RESTful APIs with Node.js and Express
- Work with SQL and NoSQL databases
- Implement authentication and authorization
- Deploy backend services to the cloud
- Optimize and secure backend applications

#### Course Requirements

- Basic programming knowledge recommended
- A computer with Node.js and a code editor installed

#### Who This Course Is For

- Beginners interested in backend development
- Developers aiming to specialize in server-side programming
- Professionals building scalable web services

#### Syllabus (35 Sessions)

- 1. Backend Development Fundamentals**
  - Introduction to backend development
  - Setting up Node.js and VS Code
  - Understanding servers and HTTP
  - Basic Node.js scripts
- 2. Introduction to Express**
  - Setting up an Express server
  - Handling HTTP methods (GET, POST)
  - Creating basic routes
  - Middleware basics
- 3. REST API Basics**
  - Understanding REST principles

- Building a simple REST API
- Handling query parameters
- Testing with Postman
- 4. **Working with Databases**
  - SQL vs. NoSQL databases
  - Setting up MongoDB with Mongoose
  - Basic CRUD operations
  - Connecting Express to MongoDB
- 5. **Environment Setup**
  - Using environment variables
  - Configuring .env files
  - Managing dependencies with npm
  - Debugging Node.js applications
- 6. **Authentication Basics**
  - Introduction to JWT
  - User registration and login
  - Password hashing with bcrypt
  - Securing API endpoints
- 7. **Version Control for Backend**
  - Git and GitHub for backend projects
  - Managing backend codebases
  - Branching strategies
  - Collaborative workflows
- 8. **API Error Handling**
  - Handling errors in Express
  - Creating custom error responses
  - Logging errors
  - Testing error scenarios
- 9. **Practice Session**
  - Build a simple API for a to-do list
  - Congratulations! You've built a backend foundation.
- 10. **Advanced Express**
  - Middleware deep dive
  - Route modularization
  - File uploads with Multer
  - API rate limiting
- 11. **SQL Databases**
  - Introduction to PostgreSQL
  - Setting up Sequelize ORM
  - Creating database schemas
  - Performing joins and queries
- 12. **Advanced MongoDB**
  - Aggregation pipelines
  - Indexing for performance
  - Handling large datasets

- MongoDB transactions
- 13. Introduction to NestJS**
  - Setting up a NestJS project
  - Controllers and services
  - Dependency injection
  - Connecting to MongoDB
- 14. API Documentation**
  - Documenting APIs with Swagger
  - API versioning
  - Creating API specs
  - Testing documented APIs
- 15. Advanced Authentication**
  - OAuth 2.0 integration
  - Role-based access control
  - Refresh tokens
  - Securing sensitive routes
- 16. Practice Session**
  - Build a user management API with NestJS
  - Congratulations! You're an intermediate backend developer.
- 17. Real-Time Applications**
  - Introduction to WebSockets
  - Setting up Socket.IO
  - Building a real-time notification system
  - Testing real-time features
- 18. Microservices Basics**
  - Introduction to microservices
  - Creating a microservice with NestJS
  - Inter-service communication
  - Using message queues (e.g., RabbitMQ)
- 19. Backend Testing**
  - Unit testing with Jest
  - Integration testing for APIs
  - Mocking dependencies
  - Testing database interactions
- 20. Performance Optimization**
  - Caching with Redis
  - Load balancing basics
  - Optimizing database queries
  - Monitoring with PM2
- 21. Security Best Practices**
  - Preventing XSS and SQL injection
  - Implementing CORS and CSRF protection
  - Securing environment variables
  - Auditing with npm audit
- 22. TypeScript in Backend**

- TypeScript setup with Node.js
- Type-safe APIs with NestJS
- Using interfaces for data models
- Refactoring Express to TypeScript

### 23. Deploying Backend Services

- Deploying to Heroku
- Configuring Docker containers
- Setting up CI/CD with GitHub Actions
- Managing production environments

### 24. Practice Session

- Deploy a REST API to Heroku
- Congratulations! You've mastered backend development.

### 25. Project 1: Task Manager API

- Build a task management API with Express
- Implement CRUD operations
- Add JWT authentication
- Test with Postman

### 26. Project 2: E-Commerce Backend

- Create a product and order API with NestJS
- Integrate Stripe for payments
- Add search and filtering
- Document with Swagger

### 27. Project 3: Real-Time Chat API

- Build a chat API with Socket.IO
- Implement user presence
- Store messages in MongoDB
- Secure with JWT

### 28. Project 4: Blog CMS Backend

- Create a CMS API with NestJS
- Manage blog posts and users
- Add role-based access
- Deploy to Heroku

### 29. Project 5: Authentication Service

- Build a microservice for authentication
- Use OAuth 2.0 and JWT
- Integrate with Redis for sessions
- Test with Jest

### 30. Project 6: Data Import API

- Create an API to import CSV data
- Validate and process data
- Store in PostgreSQL
- Add error handling

### 31. Advanced Database Design

- Database normalization
- Designing complex schemas



- Optimizing queries with indexes
- Handling migrations

### 32. Serverless Backend

- Introduction to serverless with AWS Lambda
- Building APIs with Serverless Framework
- Integrating with API Gateway
- Deploying serverless functions

### 33. Project 7: Analytics API

- Build an analytics API with NestJS
- Store metrics in PostgreSQL
- Create aggregation endpoints
- Deploy with Docker

### 34. Monitoring and Scaling

- Setting up monitoring with New Relic
- Scaling with Kubernetes basics
- Load testing with Artillery
- Handling high traffic

### 35. Final Exam and Wrap-Up

- Comprehensive exam on backend concepts
- Review of key skills and best practices
- Guidance on backend career paths
- Certificate of completion