

# Backend Development Curriculum

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Duration: 12 Weeks

Mode: Hybrid (Physical & Virtual Options)

Certification: Completion Certificate + Real-World Project Management Simulation

## Week 1: JavaScript Fundamentals for Backend

- Core JavaScript concepts

- Variables (var, let, const), functions, and scopes

- Asynchronous programming: callbacks, promises, async/await

- Introduction to the fs module and file handling in Node.js

- Error handling with try-catch

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## Week 2: Introduction to Backend Development

- Overview of backend development with Node.js

- Setting up the development environment

- Installing Node.js, npm, and an IDE like VS Code

- Setting up version control with Git and GitHub

- Introduction to HTTP/HTTPS and REST architecture

- Basic Node.js scripts: console.log(), modules, and package management with npm

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## Week 3: Introduction to Express.js

- Setting up an Express.js project

- Understanding middleware and creating custom middleware

- Handling routes and HTTP methods (GET, POST, PUT, DELETE)

Sending responses and status codes

Building a simple API with Express

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#### Week 4: Working with Databases

Introduction to MongoDB and Mongoose

Connecting a Node.js application to MongoDB

CRUD operations with Mongoose

Schema design and data validation

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#### Week 5: Authentication and Authorization

Introduction to authentication vs. authorization

User authentication with bcrypt for password hashing

Session-based authentication vs. JWT-based authentication

Implementing JWT in an Express application

Role-based access control and protected routes

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#### Week 6: Advanced Express.js Concepts

Structuring a large-scale Express project

MVC (Model-View-Controller) architecture

Using Express Router for modular routing

Error handling in Express applications

Serving static files

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#### Week 7: APIs and Advanced Features

RESTful API best practices

Query parameters, path parameters, and request body

Pagination and filtering

File uploads with Multer

Building an API for a real-world use case

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## Week 8: Deploying Node.js Applications

Introduction to cloud platforms (e.g., Heroku, Render, AWS)

Environment variables and .env files

Building and deploying a production-ready Express application

Basics of Docker and containerizing a Node.js app

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## Week 9: Real-Time Communication

Introduction to WebSockets

Building real-time applications with Socket.IO

Real-time chat application

Notifications

Integrating WebSockets with an Express application

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## Week 10: Testing and Debugging

Introduction to testing in Node.js

Unit testing with Jest

Load testing APIs with tools like Postman or Apache JMeter

Optimizing database queries and indexing in MongoDB

Using the Node.js debugger and logging with Winston or Morgan

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## Week 11 - Week 12: Capstone Project

Building a complete backend application using Node.js, Express, and MongoDB

Authentication and role-based access

CRUD operations with pagination and filtering

Real-time updates with WebSockets

Deploying the project to a cloud platform

Code review and project presentation