

Modern Web Application Development with Node.js, SQL, and React

Duration: 14 Days

Goal: Build production-ready APIs with SQL and scalable React applications

Week 1 — Node.js API Development with SQL & Production Practices

Day 1 — Node.js Fundamentals for API Development

Topics

- Node.js runtime architecture
- Event loop and asynchronous programming
- REST API fundamentals
- Project setup and folder structure
- Introduction to backend frameworks

Hands-on

- Setup Node.js project
- Create first REST API
- Implement basic routing

Day 2 — Introduction to Hapi Framework

Topics

- What is Hapi and why use it
- Hapi vs Express vs Fastify
- Hapi server configuration
- Routing in Hapi
- Request and response lifecycle

Hands-on

- Install Hapi

- Create Hapi server
- Build CRUD API

Day 3 — SQL Database Integration (PostgreSQL / Oracle)

Topics

- SQL vs NoSQL architecture
- Database schema design
- Connecting Node.js to SQL database
- Using PostgreSQL driver / ORM
- Environment-based database configuration

Hands-on

- Install PostgreSQL
- Create database and tables
- Connect Node.js to database
- Insert and retrieve records

Day 4 — Advanced Database Operations

Topics

- CRUD operations with SQL
- Transactions
- Connection pooling
- Query optimization basics
- Error handling in database operations

Hands-on

- Build API with:
 - Create
 - Read
 - Update
 - Delete

- Implement transactions

Day 5 — API Validation and Error Handling

Topics

- Input validation strategies
- Request validation
- Response validation
- Centralized error handling
- Data sanitization

Hands-on

- Implement validation middleware
- Handle API errors
- Create validation schema

Day 6 — Logging and Environment Configuration

Topics

- Logging best practices
- Log levels
- Environment configuration
- Using environment variables
- Configuration management

Hands-on

- Implement logging system
- Create environment configuration
- Setup development vs production configs

Day 7 — API Documentation and Security

Topics

- OpenAPI / Swagger fundamentals
- API documentation standards
- Authentication basics
- Authorization concepts
- API security best practices

Hands-on

- Generate Swagger documentation
- Implement API authentication
- Secure API endpoints

Week 2 — React Architecture and State Management

Day 8 — React Application Architecture

Topics

- React project structure for large applications
- Component-based architecture
- Feature-based folder structure
- Separation of concerns
- Scalable design patterns

Hands-on

- Create scalable React folder structure
- Build modular components

Day 9 — State Management Fundamentals

Topics

- Local vs global state

- Prop drilling problem
- State management patterns
- Introduction to Redux

Hands-on

- Install Redux
- Create store
- Implement actions and reducers

Day 10 — Advanced Redux and Middleware

Topics

- Redux middleware
- Async state management
- Redux Toolkit
- API integration with Redux
- Performance optimization

Hands-on

- Implement async API calls
- Manage loading and error states

Day 11 — UI Development with Material UI

Topics

- Introduction to Material UI
- Component libraries benefits
- Layout system
- Theming
- Responsive design

Hands-on

- Install Material UI
- Build UI using components

- Customize theme

Day 12 — API Integration in React

Topics

- Connecting React to backend APIs
- Axios / Fetch integration
- Error handling
- Loading states
- Data caching basics

Hands-on

- Connect React to Node.js API
- Display data from database

Day 13 — Best Practices for Large React Applications

Topics

- Code organization
- Reusable components
- Custom hooks
- Performance optimization
- Lazy loading and code splitting

Hands-on

- Implement lazy loading
- Create reusable components
- Optimize rendering

Day 14 — Capstone Project (Production-Ready Application)

Project

Full-Stack Application

Features:

- Node.js and Hapi API
- PostgreSQL database
- Swagger documentation
- Authentication
- Logging
- Validation
- React frontend
- Redux state management
- Material UI interface