

MERN Stack Development

(MongoDB · Express · React · Node.js)

Course Duration

- **Total Duration:** 90–120 Hours
- **Theory:** 30%
- **Practical / Projects:** 70%

Prerequisites

- Basic Computer Fundamentals
- Basic HTML, CSS, JavaScript
- Understanding of programming concepts

Module 1: Web Development Fundamentals (6 Hours)

- How the Web Works
- Client–Server Architecture
- HTTP & HTTPS
- Request–Response Cycle
- RESTful Architecture Basics
- Introduction to APIs

Module 2: HTML5 & CSS3 (Quick Review) (8 Hours)

HTML

- HTML5 Structure
- Forms and Input Controls
- Semantic Elements

CSS

- CSS Selectors
- Box Model
- Flexbox
- Grid Layout
- Responsive Design
- Media Queries

Module 3: JavaScript (Core + ES6) (14 Hours)

- JavaScript Basics
- Variables & Data Types
- Operators
- Control Statements

- Functions
- Arrays & Objects
- ES6 Features
 - let & const
 - Arrow Functions
 - Destructuring
 - Spread & Rest
 - Template Literals
 - Modules
- Asynchronous JavaScript
 - Callbacks
 - Promises
 - async / await

Module 4: Node.js Fundamentals (10 Hours)

- Introduction to Node.js
- Node.js Architecture
- NPM & Package.json
- Core Modules
 - fs
 - http
 - path
 - os
- Creating Web Server using Node.js
- Environment Variables

Module 5: Express.js Framework (10 Hours)

- Introduction to Express
- Express Application Structure
- Routing
- Middleware
- Request & Response Objects
- REST API Development
- Error Handling
- Express Best Practices

Module 6: MongoDB (Database) (12 Hours)

- Introduction to NoSQL
- MongoDB Architecture
- Collections & Documents
- CRUD Operations
- MongoDB Queries
- Indexes
- Data Modeling
- MongoDB Atlas (Cloud Database)

Module 7: Mongoose (ODM) (6 Hours)

- Introduction to Mongoose
- Schemas & Models
- Validation
- CRUD with Mongoose
- Relationships (Reference vs Embedded)
- Pagination & Filtering

Module 8: React.js Fundamentals (16 Hours)

- Introduction to React
- JSX
- Components (Functional)
- Props & State
- Event Handling
- Conditional Rendering
- Lists & Keys
- Component Lifecycle (Hooks Overview)

Module 9: React Hooks & Advanced Concepts (12 Hours)

- useState
- useEffect
- useContext
- useRef
- Custom Hooks
- Controlled & Uncontrolled Components
- React Router
- Code Splitting

Module 10: Frontend–Backend Integration (8 Hours)

- Connecting React with REST APIs
- Axios / Fetch
- Environment Configuration
- Handling Loading & Errors
- Authentication Flow (Frontend)

Module 11: Authentication & Authorization (10 Hours)

- User Authentication Concepts
- JWT (JSON Web Tokens)
- Password Hashing (bcrypt)
- Role-Based Access Control
- Protected Routes
- Session vs Token Authentication

Module 12: State Management & Performance (6 Hours)

- Lifting State Up

- Context API
- Introduction to Redux (Overview)
- Performance Optimization
- Memoization

Module 13: Testing & Debugging (6 Hours)

- Debugging Node.js Applications
- API Testing using Postman
- Frontend Testing (Overview)
- Error Handling Strategies

Module 14: Deployment & DevOps Basics (8 Hours)

- Build Process
- Environment Variables
- Deployment of MERN App
- Hosting Platforms (AWS / Vercel / Render)
- MongoDB Atlas Integration
- CI/CD Overview
- Basic Security Practices

Module 15: Projects & Case Studies (20 Hours)

Mini Projects:

- Todo Application
- User Authentication System
- REST API Project

Major Project:

- Full-Stack Web Application (e.g. LMS / E-Commerce / CRM)
- Role-Based Login
- CRUD + Search + Pagination
- Deployment with Cloud Database

Learning Outcomes

After completing the course, learners will be able to:

- Build full-stack web applications using MERN
- Design RESTful APIs
- Implement authentication & authorization
- Connect frontend with backend securely
- Deploy production-ready applications