

MERN Stack Course Syllabus

Total Duration: 180hrs

Module 1: Frontend Development with React.js

Chapter 1: Web Development Foundations

- Overview of the internet, HTTP/HTTPS, DNS, client-server architecture
- Role of frontend vs backend in full-stack applications
- Introduction to the MERN Stack (MongoDB, Express.js, React.js, Node.js)

Chapter 2: HTML and CSS

HTML:

- Document structure and DOCTYPE
- Semantic HTML tags (header, section, article, footer)
- Forms, input types, labels, validation attributes
- Media elements: images, videos, audio
- Links, tables, lists

CSS:

- Selectors, specificity, and inheritance
- Box Model
- Display properties (block, inline, inline-block)
- Positioning (static, relative, absolute, fixed)
- Flexbox and CSS Grid
- Media Queries and Responsive Design
- CSS variables
- Basic animations and transitions



Chapter 3: JavaScript (ES6+)

- Variables: let, const, var
- Data types and type coercion
- Operators and expressions
- Conditional statements and loops
- Functions: declarations, expressions, arrow functions
- Scope, hoisting, closures
- Arrays and array methods (map, filter, reduce)
- Objects and object manipulation
- DOM Manipulation and Events
- Event bubbling and delegation
- JSON, localStorage, sessionStorage
- ES6+ features: destructuring, spread/rest, template literals, default parameters

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Chapter 4: Git and Version Control

- Git installation and configuration
- Basic Git commands (init, clone, add, commit, push, pull)
- Branching and merge conflicts
- GitHub repository management

Chapter 5: React.js Fundamentals

- Introduction and environment setup
- JSX syntax and rules
- Functional and Class Components



- Props and Prop Drilling
- State and Lifecycle
- Event handling
- Lists and Keys

Chapter 6: React.js Advanced Concepts

- React Hooks: useState, useEffect, useRef, useContext
- Controlled vs uncontrolled inputs
- Lifting state up
- React Router DOM: routing, navigation, dynamic routes
- Conditional rendering
- Component composition and children props
- Error boundaries

Chapter 7: State Management

- Context API
- Redux Basics
- Redux Toolkit (slices, reducers, store)
- Connecting Redux with React (useSelector, useDispatch)
- Redux Thunk for asynchronous logic

Chapter 8: Frontend Tools and Libraries

- Axios or Fetch for API requests
- Formik and Yup for form validation



- UI libraries: Bootstrap, Material UI, or Tailwind CSS
- Toast notifications using react-toastify

Chapter 9: Frontend Deployment

- Production build of React app
- Deployment on Netlify, Vercel, or GitHub Pages
- Environment variables setup
- CI/CD basics for frontend projects

Module 2: Node.js, Express.js, MongoDB, and Full Stack Integration

Chapter 1: Node.js Fundamentals

- Introduction to Node.js
- Node.js vs Browser JavaScript
- Global objects and process
- NPM/Yarn basics
- File system (fs module) and path module
- Asynchronous programming (callbacks, promises, async/await)
- Event-driven architecture and EventEmitter

Chapter 2: Express.js Framework

- Setting up Express.js application
- CRUD routes (GET, POST, PUT, DELETE)
- Middleware (built-in, custom, third-party)
- Request and response handling



- URL parameters and query strings
- Error handling middleware
- CORS and Helmet

Chapter 3: MongoDB and Mongoose

- NoSQL and MongoDB overview
- MongoDB installation and use of MongoDB Atlas
- CRUD operations via Mongo Shell and Compass
- Mongoose: connection, schema, and model creation
- Data validation and default values
- Relationships: embedding vs referencing
- Population and virtual fields



Chapter 4: Building RESTful APIs

- Designing endpoints for CRUD operations
- Organizing controllers and routes
- Using Postman or Insomnia for API testing
- Implementing pagination and filtering
- HTTP response status codes and structure

Chapter 5: Authentication and Authorization

- User registration and login
- Hashing passwords using bcrypt
- Token-based authentication using JWT



- Middleware for route protection
- Role-based access control

Chapter 6: File Uploads and Emails

- File uploads with Multer
- Image storage (local or via Cloudinary/AWS S3)
- Email sending using Nodemailer
- Email verification and password reset

Chapter 7: Full Stack Integration (React + Express + MongoDB)

- Connecting frontend and backend using Axios
- Using Redux or Context for user authentication
- Managing protected frontend routes
- Token storage: HTTP-only cookies vs localStorage
- Form handling and syncing data with backend

Chapter 8: Testing

- Unit testing with Jest or Mocha
- Integration testing using Supertest
- Testing React components with React Testing Library

Chapter 9: WebSockets and Real-Time Data (Optional)

- Introduction to WebSockets
- Real-time communication with Socket.IO



• Broadcasting messages and managing rooms

Chapter 10: Backend Deployment

- Deploying Node.js backend on Render, Railway, or Heroku
- Using MongoDB Atlas in production
- Handling environment variables
- End-to-end connection with deployed frontend
- CI/CD setup for backend

