

(Building Futures Through Digital Knowledge and Innovation)

Full Stack Web Development (MERN) (12 Months)

Syllabus

1. Introduction to Web Development

- ✓ What is web development?
- ✓ Frontend vs Backend vs Full Stack
- ✓ Overview of MERN Stack: MongoDB, Express.js, React.js, Node.js
- ✓ Tools and environment setup: VS Code, Git, npm, MongoDB Compass, Postman
- ✓ Understanding RESTful architecture and APIs

2. HTML, CSS, and Responsive Design

- ✓ HTML5: structure, tags, semantic elements
- ✓ CSS3: selectors, box model, positioning, transitions
- ✓ Flexbox and CSS Grid
- ✓ Responsive Web Design with Media Queries
- ✓ Bootstrap and Tailwind CSS introduction

3. JavaScript Essentials

- ✓ JavaScript syntax, variables, and data types
- ✓ Arrays, objects, functions, and loops
- ✓ ES6+ features: let/const, arrow functions, spread/rest, destructuring
- ✓ DOM manipulation and event handling
- ✓ Introduction to Fetch API and JSON

4. Version Control with Git and GitHub

- ✓ Installing and configuring Git
- ✓ Git commands: clone, commit, push, pull, branch, merge
- ✓ Managing repositories on GitHub
- ✓ Collaboration and resolving merge conflicts

5. Advanced JavaScript & Modern Practices

- ✓ Closures, callbacks, and promises
- ✓ Async/await and handling asynchronous operations
- ✓ JavaScript modules and bundling
- ✓ Error handling and debugging techniques

6. React.js Front-end Development

- ✓ Introduction to React and componentbased architecture
- ✓ JSX syntax and rendering elements
- ✓ Functional vs class components
- ✓ State, props, and event handling
- ✓ React Hooks: useState, useEffect, useRef, useContext

- ✓ Conditional rendering and list rendering
- ✓ Form handling and validation
- ✓ React Router for navigation

7. Styling in React

- ✓ CSS modules, styled components
- ✓ Tailwind CSS with React
- ✓ Responsive design in React applications
- ✓ Animations with Framer Motion

8. Backend Development with Node.js

- ✓ Introduction to Node.js and npm
- ✓ Building a server with HTTP module
- ✓ Understanding the Event Loop
- ✓ Creating RESTful APIs with Express.js
- ✓ Middleware and routing in Express
- ✓ Error handling and logging

9. Working with MongoDB and Mongoose

- ✓ NoSQL vs SQL databases
- ✓ Introduction to MongoDB and MongoDB Atlas
- ✓ CRUD operations using MongoDB
- ✓ Integrating MongoDB with Mongoose
- ✓ Schema design, validations, and population

10. Working with MongoDB and Mongoose

- ✓ Connecting React frontend with Express/Node backend
- ✓ Using Axios or Fetch for API requests
- ✓ Creating reusable API endpoints
- ✓ Managing state with React Context or Redux (optional)
- ✓ Cross Origin Resource Sharing (CORS) and API security

11. Authentication and Authorization

- ✓ User authentication with JWT (JSON Web Tokens)
- ✓ Password hashing with bcrypt
- ✓ Login, register, logout functionality
- ✓ Protected routes and role-based access control
- ✓ Cookies vs Tokens

12. Deployment and Hosting

- ✓ Preparing frontend and backend for production
- ✓ Deploying Node.js API to platforms like Render, Railway, or Heroku
- ✓ Deploying React frontend to Netlify or Vercel

- ✓ Hosting MongoDB with Atlas
- ✓ Environment variables and configuration

13. Advanced Features and Optimization

- ✓ Pagination and filtering in APIs
- ✓ File uploads with Multer
- ✓ Image storage using Cloudinary or Firebase
- ✓ Performance optimization for React apps
- ✓ Code splitting and lazy loading
- ✓ Caching techniques

14. Testing and Debugging

- ✓ Debugging tools and techniques (browser dev tools, console, Postman)
- ✓ Unit testing with Jest
- ✓ Component testing in React with React Testing Library
- ✓ API testing with Postman or Supertest

15. Real-world Project Development

- ✓ Building a complete MERN stack project (e.g., Ecommerce, Blog, Social Media app)
- ✓ GitHub project structure and collaboration
- ✓ Project presentation and documentation
- ✓ Code quality and code reviews

16. Soft Skills & Freelancing Essentials

- ✓ Writing clean and readable code
- ✓ Developer portfolio and resume creation
- ✓ Freelancing platforms (Upwork, Fiverr)
- ✓ Introduction to Agile, Scrum & working with teams

17. Admin Dashboard & Charting

- ✓ Admin panel using React
- ✓ Rolebased permissions
- ✓ Data visualization with Recharts or Chart.js
- ✓ Analytics dashboard implementation

18. AI Integration in MERN Stack Projects

- ✓ Introduction to AI and its role in web development
- ✓ Using OpenAI's GPT models via API (e.g., ChatGPT integration)
- ✓ Building intelligent chatbots with React + Node.js
- ✓ Sentiment analysis using external ML APIs
- ✓ Image recognition using TensorFlow.js or external APIs
- ✓ AIpowered search and recommendations
- ✓ Ethics and responsible AI usage in web applications