Semester Lecture Plan

Name of the college: Government College of Arts, Science and Commerce, Sanquelim - Goa

Name of Faculty: Nilesh Natekar	**Subject:** Computer Science

Paper code: CSC207 – Web Technologies	**Program/Course: S.Y.B.Sc.**	**Division: A**

Academic year: 2025 - 2026	**Semester: IV**	**Total Lectures: 45 + 30**

Course Objectives:

1. Gain a comprehensive understanding of full-stack web development concepts, encompassing front-end technologies (HTML, CSS, JavaScript, React.js), back-end technologies (Node.js, Express.js), database systems (MongoDB), and the principles of integrating with external APIs.

2. Develop practical skills in designing, building, and deploying interactive and data-driven web applications utilizing the MERN (MongoDB, Express.js, React.js, Node.js) stack, including the ability to connect with and utilize external APIs.

3. Introduce modern front-end development practices with React.js, including component-based architecture, state management using Hooks, and effective UI development techniques.

4. Enable students to critically evaluate different architectural choices and technologies within the full-stack development landscape, including the role and implications of API integrations, and understand their implications for application development and deployment.

Course Learning Outcome:

Upon completion of the course students should be able to::

CO1. Recall fundamental web development principles and describe the core concepts of the MERN stack, including the roles of HTML, CSS, JavaScript, React.js, Node.js, Express.js, and MongoDB, as well as the purpose of external APIs. (Remembering/Understanding)

CO2. Apply front-end fundamentals (HTML, CSS, JavaScript) to develop basic user interfaces and build functional back-end applications using Node.js, Express.js, and MongoDB to handle data and HTTP requests. (Applying)

CO3. Integrate React.js for dynamic front-end development with a Node.js/Express.js back-end and MongoDB to create full-stack MERN applications capable of performing Create, Read, Update, and Delete (CRUD) operations and interacting with external APIs. (Applying)

CO4.	Design and develop interactive and data-driven web applications utilizing the MERN stack, demonstrating proficiency in component-based architecture, state management, event handling, and the ability to implement features by integrating with external services through API consumption. (Creating)					

Month	Lectures From: To:	No. of lectures allotted	Topic, Subtopic to be covered	Learning outcome	ICT Tools	Reference books
December	01/12/2025 to 06/12/2025	03	Introduction to Web Development o Client-Server Architecture o Overview of Front-end, Back-end, and Databases o Introduction to the MERN Stack o Introduction to Web APIs as a mechanism for web applications to interact with external services and data. Examples of common API use cases such as fetching weather data, displaying maps, or integrating with social media platforms.	1. Explain overview of web development	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. 2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025

December	08/12/2025 to 13/12/2025	03	HTML Fundamentals o Basic HTML Structure (Elements, Attributes) o Common HTML Tags (Div, Span, Heading, Paragraph, List, Form, Input) o Understanding HTML Structure for Component Rendering	1. Explain basic HTML	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
December	15/12/2025 to 23/12/2025	03	CSS Fundamentals o Introduction to CSS (Inline, Internal, External) o Basic Selectors (Element, Class, ID) o Core CSS Properties (Color, Background, Font, Margin, Padding) o Introduction to Layout (Display: block, inline, inline-block)	1. Explain basic CSS	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
January	02/01/2026 to 10/01/2026	03	JavaScript Essentials – o Introduction, Syntax and Statements o Comments, Operators, Variables, Assignment o Control Flow: Loops (for, while, do-while), Conditional Statements	1. Explain basics of Javascript syntax	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**

Month	Dates	No.	Topics	Learning Outcomes	Teaching Aids	References
			(if, else, switch), Break & Continue			
			o Data Types: Primitive (Number, String, Boolean, Null, Undefined, Symbol), Object			
			o let ,const, var, Block Scope o Template Literals (String Interpolation)			
January	12/01/2026 to 17/01/2026	03	o for... Loops, Array Iteration Methods (map, filter, reduce) o Arrow Functions, this keyword o Objects: Properties, Methods, this o Spread operator (…) for Arrays and Objects o Destructuring Assignment (Arrays and Objects)	1. Explain advanced javascript syntax	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
January	19/01/2026 to 24/01/2026	03	Introduction to React : o What is React? Advantages and Disadvantages o Virtual DOM and its Benefits o Setting up a React Development	1. Explain React basics	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. 2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB,

			Environment (create-react-app) o JSX: Syntax and Rules o Creating and Rendering React Elements			Express, React, and Node.js Paperback – 28 February 2025
January	26/01/2026 to 31/01/2026	03	Components : o Functional Components vs. Class Components o Props: Passing Data Down the Component Tree o State: Managing Component-Specific Data o Component Composition o Reusable Components	1. Explain components in React	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
February	02/02/2026 to 07/02/2026	03	React Hooks : o Introduction to Hooks: Why Hooks? o useState: Managing State in Functional Components o useEffect: Handling Side Effects (Data Fetching, Subscriptions)	1. Explain and use Hooks	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
February	09/02/2026 to 14/02/2026	03	o useContext: Sharing State Across Components	1. Explain Hooks concepts	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with

Month	Date		Topic		Teaching Aid	Reference Books
			o Basic Understanding of Other Built-in Hooks (useRef, useMemo, useCallback)			MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
February	16/02/2026 to 21/02/2026	03	Event Handling in React: o Synthetic Events o Passing Event Handlers as Props o Handling Form Events	1. Explain Event Handling in React	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
February	23/02/2026 to 28/02/2026	03	Introduction to Node.js o What is Node.js? Its Architecture and Event Driven, Non-Blocking I/O Model o Advantages of Node.js for Web Development o Node.js Process Model o Node Package Manager (NPM): Introduction and Basic	1. Explain the basics of NodeJS	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**

			Commands (npminit, npm install, npm start) Node.js Modules o Core Modules (e.g., http, fs, path) o Importing and Exporting Modules (require, module.exports, export, import) o Creating and Using Custom Modules			
March	02/03/2026 to 07/03/2026	03	Introduction to Express.js o What is Express.js? Its Features and Advantages o Setting up a Basic Express.js Application o Middleware: Understanding and Using Basic Middleware o Routing: Defining Routes and Handling Different HTTP Methods (GET, POST) o Basic Route Parameters	1. Explain the basic of Express.js	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**

March	09/03/2026 to 14/03/2026		Handling HTTP Requests and Responses o Request Object : Accessing Query Parameters, Request Body o Response Object : Sending Responses (Text, JSON) o HTTP Status Codes Introduction to NoSQL and MongoDB o Document-Oriented Databases o Key Features of MongoDB o Databases and Collections o Documents and Fields	1. Explain setting up of server using Express.js 2. Explain basics of mongodb	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
		03				
March	16/03/2026 to 21/03/2026		Basic CRUD Operations in MongoDB : o Insert Operations (insertOne, insertMany) o Read Operations (find, findOne)	1. Explain Basic CRUD operations in MongoDB	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS,**
		03				

			o Update Operations (updateOne, updateMany) o Delete Operations (deleteOne, deleteMany)		**MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
March	23/03/2026 to 28/03/2026	03	Introduction to API Integration: o Understanding the role of APIs in connecting the back-end with external services. o Brief overview of different types of APIs: Cloud platform APIs (e.g., basic concepts of AWS or Google Cloud APIs), Third-party APIs (e.g., WhatsApp API, ChatGPT API - their functionalities).	1. Explain basics of API integration	Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023. **2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025**
March	30/03/2026 to 31/03/2026	02	Revision		Microsoft Powerpoint Presentation, LCD Projector	1. Nabendu Biswas, Ultimate Full-Stack Web Development with MERN: Design, Build, Test and Deploy Production-Grade Web Applications with MongoDB, Express, React and NodeJS Paperback – 1 December 2023.

						2. Riaz Ahmed, Modern Full Stack Web Development With MERN For Beginners: Develop Real-World Projects With HTML, Tailwind CSS, MongoDB, Express, React, and Node.js Paperback – 28 February 2025

Practical Component

Month	Lectures From: To:	No. of lectures allotted	Topic, Subtopic to be covered	Learning outcome	ICT Tools	Reference books
December	01/12/2025 to 06/12/2025	02	Setting up the development environment: Installing necessary software (code editor, browser). Creating basic HTML pages: Practicing with different HTML elements (text, headings, lists, links, images). Understanding the structure of an HTML document and using developer tools to inspect the DOM. Working with HTML forms: Creating various types of input fields, buttons, checkboxes, and radio buttons. Understanding form attributes and the element. element.	1. Implement HTML concepts	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp https://www.w3schools.com/react/default.asp#gsc.tab=0
December	08/12/2025 to 13/12/2025	02	Introduction to CSS: Applying inline styles to HTML elements	1. Implement CSS	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp https://www.w3schools.com/react/default.asp#gsc.tab=0

			and understanding specificity. Creating internal stylesheets within the section and applying basic CSS properties (color, background, font family, font-size). Working with external CSS stylesheets: Creating separate .css files and linking them to HTML documents using the tag. Deep dive into CSS selectors: Practicing with element selectors, class selectors, ID selectors, and basic combinators.			
December	15/12/2025 to 23/12/2025	02	Experimenting with core CSS properties: Margin, padding, border, box model understanding. Working with basic JavaScript examples, arrays, templates.	1. Implement CSS and basics of Javascript	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp https://www.w3schools.com/react/default.asp#gsc.tab=0

January	02/01/2026 to 10/01/2026 02	Working with arrow functions in JavaScript.	1. Implement advanced features of Javascipt	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**
January	12/01/2026 to 17/01/2026 02	Working with examples on map, filter, reduce Working with examples on Spread operator, destructuring	1. Implement advanced features of Javascipt	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**
January	19/01/2026 to 24/01/2026 02	Setting up a React development environment, Create React App. Understanding the basic file structure of a React application. Creating and rendering your first React component (functional component) and displaying simple content. Working with JSX syntax to create React elements and understanding its transformations.	1. Implement React Components	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**

Month						
			Passing data to components using props and understanding the flow of data down the component tree.			
January	26/01/2026 to 31/01/2026	02	Creating and rendering multiple components and understanding component composition. Managing component state using the useState hook in functional components. Understanding how state changes trigger re-renders and the concept of immutability. Creating interactive components that update their UI based on state changes (e.g., a counter).	1. Implement components and use Hooks	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp https://www.w3schools.com/react/default.asp#gsc.tab=0
February	02/02/2026 to 07/02/2026	02	Handling events in React components (e.g., button clicks, input changes) using synthetic events.	1. Implement Event Handling	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp https://www.w3schools.com/react/default.asp#gsc.tab=0

			Passing event handler functions as props to child components.			
February	09/02/2026 to 14/02/2026		Working with form elements in React: Managing form state using use State for controlled components. Introduction to the use Effect hook for handling side effects in functional components (basic examples like logging on component mount and unmount).	1. Use Hooks	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**
		02				
February	16/02/2026 to 21/02/2026		Creating a simple context to share data between components. Using the Context. Provider to supply context values. Consuming context values in functional components using use Context. Building a simple React form that takes user input for	1. Implement React Forms	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**
		02				

			multiple fields and logs the data on submission.			
February	23/02/2026 to 28/02/2026	02	Setting up a Node.js environment and initializing a new Node.js project using npm init. Understanding the package.json file and using npm to install packages (e.g., express). Creating a basic HTTP server using Node.js's built-in http module to handle simple requests and responses. Introduction to Express.js: Creating a basic Express.js application instance. Defining routes for different HTTP methods (GET, POST) using app.get() and app.post(). Sending basic text and HTML responses from Express.js routes.	1. Setup Node.js web server 2. Implement Express.js concepts	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**

Month	Date		Topic	Practical	Tools	Reference
March	02/03/2026 to 07/03/2026		Handling HTTP requests in Express.js: Accessing query parameters using req.query and request body using middleware like express.json(). Sending JSON responses from Express.js routes with different status codes. Implementing basic middleware functions for request logging or other pre-processing tasks.	1. Implement handling requests and sending response	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**
		02				
March	09/03/2026 to 14/03/2026		Setting up a local MongoDB database (or signing up for a cloud-based MongoDB service like MongoDB Atlas). Connecting a Node.js/Express.js application to MongoDB using a MongoDB driver like mongoose. Defining a simple MongoDB schema for the data that will be handled by the	1. setup a mongodb server and define simple schema	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**
		02				

			React form (e.g., name, email).			
March	16/03/2026 to 21/03/2026		Implementing basic CRUD operations in the Node.js/Express.js backend using Mongoose models: o Create: Handling a POST request from the React form to create a new document in MongoDB. o Read: Implementing a GET request to fetch data from MongoDB and send it as a JSON response to the React front-end. o Update: Implementing a PUT or PATCH request to update an existing document in MongoDB. o Delete: Implementing a DELETE request to remove a document from MongoDB.	1. Implementing basic CRUD operations in Mongodb	VS Code, LCD Projector	https://www.w3schools.com/nodejs/nodejs_express.asp **https://www.w3schools.com/react/default.asp#gsc.tab=0**
		02				
March	23/03/2026 to 28/03/2026	02	React front-end can send data to and	1. Integration of React,	VS Code,	https://www.w3schools.com/nodejs/nodejs_express.asp

| | | | | receive data from the backend API endpoints to perform CRUD operations.

Installing and using a library like node-fetch or axios in a Node.js project.

Making requests to a simple, free public API and logging the response data. Eg. Integrating a messaging API (e.g., WhatsApp Business API) to send notifications. Integrating ChatGPT API for conversational responses.

Exploring the structure of JSON responses.

Demonstrating the basic structure of interacting with a more complex API using pre-prepared examples and focusing on the request and response format. | Express and MongoDB | LCD Projector | https://www.w3schools.com/react/default.asp#gsc.tab=0 |

| March | 30/03/2026 to 31/03/2026 | | Revision | | VS Code, LCD Projector | https://www.w3schools.com/nodejs/nodejs_express.asp |
| | | 02 | | | | **https://www.w3schools.com/react/default.asp#gsc.tab=0** |