



Experiment 5

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Branch: CSE

Semester: 6th

Subject Name: Full Stack Development – II

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Date of Performance: 17-02-2026

Subject Code: 23CSH-309

1. Aim: To verify the correctness and reliability of the EcoTrack React application by writing automated tests using Jest and React Testing Library, and by analyzing application behavior using debugging tools.

2. Objective:

- Understand the purpose of automated testing in frontend applications
- Write unit tests for JavaScript utility functions using Jest
- Use different Jest matchers to validate expected outputs and behaviors
- Test React components using React Testing Library
- Verify UI rendering by querying elements from the DOM
- Implement asynchronous testing using `findBy` and `waitFor` methods
- Apply mocking to simulate API or external data responses in tests
- Perform snapshot testing to detect unintended UI changes
- Debug failing tests and application logic using browser Developer Tools and breakpoints
- Analyze application behavior and errors systematically rather than manual checking

3. Implementation / Code:

▪ Tools & Technologies Used:-

- React.js
- JavaScript (ES6)
- Jest Testing Framework
- React Testing Library
- VS Code
- Node.js & npm
- Web Browser (Chrome DevTools)

▪ Implementation Description:-

- The EcoTrack application is tested to ensure correctness of both logic and UI behavior.
- Unit testing is performed on utility functions (e.g., calculator function) using Jest.
- React Testing Library is used to render components and verify UI structure.
- Snapshot testing is applied to detect unintended UI changes over time.

- Automated tests improve application reliability and maintainability.
- Debugging tools such as browser DevTools and breakpoints help identify errors in logic or rendering.

▪ **Sample Code Snippet:-**

JS Tracker.test.js ×

src > components > JS Tracker.test.js > ...

```
1 // import { render, screen } from "@testing-library/react";
2 // import Tracker from "../Tracker";
3
4 // test("loads async data", async () => {
5 //   render(<Tracker />);
6
7 //   const text = await screen.findByText(/Eco data loaded/i, {}, { timeout: 3000 });
8
9 //   expect(text).toBeInTheDocument();
10 // });
11
12 import { render } from "@testing-library/react";
13 import Tracker from "../Tracker";
14
15 test("matches snapshot", () => {
16   const { asFragment } = render(<Tracker />);
17   expect(asFragment()).toMatchSnapshot();
18 });
```

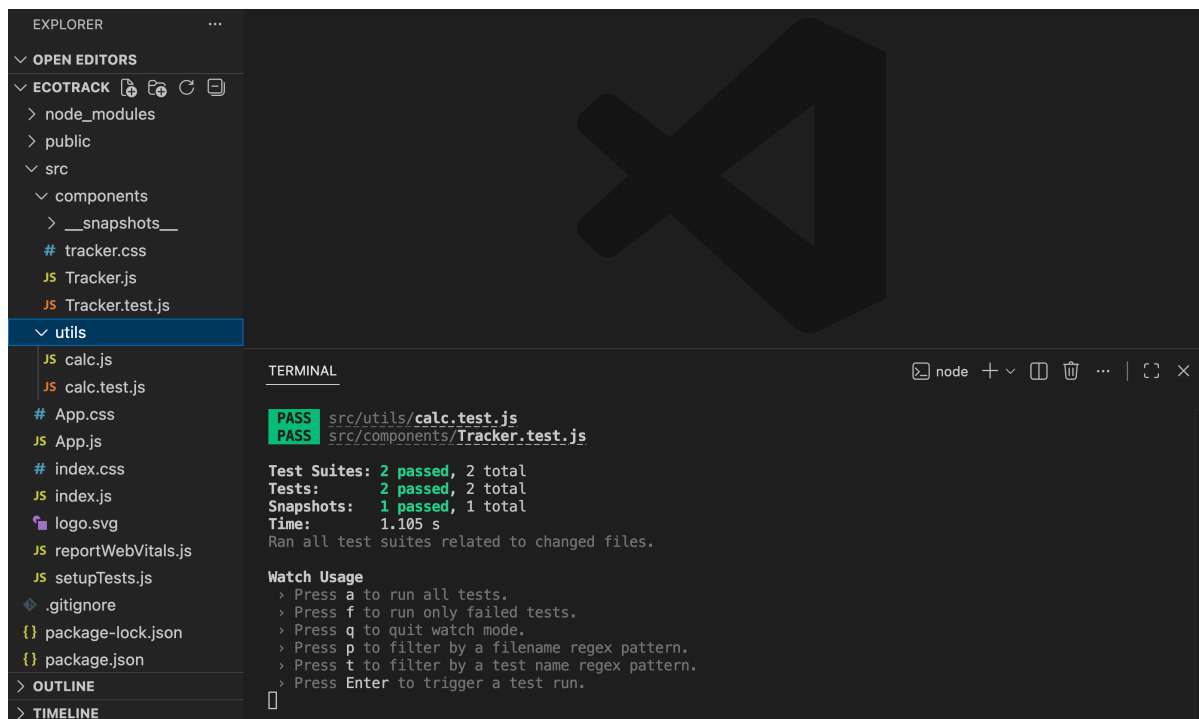
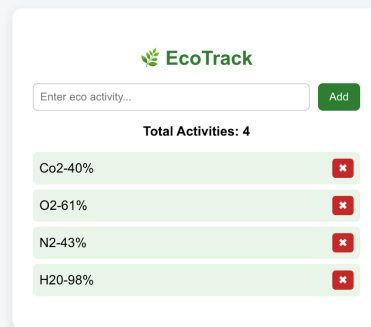
JS calc.test.js ×

src > utils > JS calc.test.js > ...

```
1 import { add } from "../calc";
2
3 test("adds two numbers", () => {
4   expect(add(2, 3)).toBe(5);
5 });
```

4. Output:

- All Jest test cases executed successfully
- Utility function test passed
- React component snapshot test passed
- No unintended UI changes detected
- EcoTrack component rendered correctly during testing
- Debugging tools confirmed correct state updates and DOM rendering



5. Learning Outcomes (What I Have Learnt):

- Importance of automated testing in frontend applications
- Writing unit tests using Jest framework
- Using matchers like `toBe()` and `toMatchSnapshot()`
- Testing React components with React Testing Library
- Validating UI rendering through DOM queries
- Understanding snapshot testing for UI stability
- Debugging React applications using DevTools and breakpoints
- Improving software reliability and maintainability through testing