IT314: Software Engineering
Group-33

White-box testing

Unit-testing

GROUP MEMBERS:

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Introduction:

- White box testing checks the internal structure, design, and code of the application. It ensures every part of the code is run and works correctly.
- In my project, I use unit testing as a key part of white box testing.
- Unit testing helps achieve 100% code coverage by testing each function and module individually.
- This approach improves the application's reliability, maintainability, and quality.

Unit testing with jest:

- Jest is specifically designed for JavaScript and is well-integrated with modern JavaScript frameworks and libraries.
- Jest for backend testing offers mocking, asynchronous testing, integration testing, detailed error reporting, parallel execution, and comprehensive code coverage for controllers, authentication, and other backend components.
- 100% code coverage ensures that every part of the code is tested, reducing the risk of undetected bugs and improving the overall reliability and maintainability of the software.

Output of Test-File and Coverage: -

- ## RegisterUser: -

```
PASS  controllers/registerUser.early.test/registerUser.early.test.js
  registerUser() registerUser method
    Happy Paths
      √ should register a new user successfully (6 ms)
    Edge Cases
      √ should return an error if the email is already registered (1 ms)
      √ should return an error if the username is already taken (1 ms)
      √ should handle errors during user registration (99 ms)

Test Suites: 1 passed, 1 total
Tests:       4 passed, 4 total
Snapshots:   0 total
Time:        1.448 s, estimated 3 s
Ran all test suites matching /registerUser.early.test.js/i.

C:\Users\jishpatel\jest_ai_3\LearnIt---Online-Learning-Portal\backend>
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```

- ## LoginUser: -

```
PASS  controllers/loginUser.early.test/loginUser.early.test.js
  loginUser() loginUser method
    Happy Paths
      √ should log in a user with valid credentials (11 ms)
    Edge Cases
      √ should return 401 if user is not found (1 ms)
      √ should return 401 if password is incorrect (1 ms)
      √ should return 500 if an error occurs during login (50 ms)

Test Suites: 1 passed, 1 total
Tests:       4 passed, 4 total
Snapshots:   0 total
Time:        1.961 s, estimated 3 s
Ran all test suites matching /loginUser.early.test.js/i.

C:\Users\jishpatel\jest_ai_3\LearnIt---Online-Learning-Portal\backend>
```

- course-controller:

1) AddNewCourse: -

```
PASS  controllers/course-controller.early.test/addNewCourse.early.test.js
  addNewCourse() addNewCourse method
    Happy paths
      √ should save a new course and return a success response (5 ms)
    Edge cases
      √ should handle errors during course saving and return a 500 response (63 ms)
      √ should handle missing course data gracefully (1 ms)

Test Suites: 1 passed, 1 total
Tests:       3 passed, 3 total
Snapshots:   0 total
Time:        1.423 s, estimated 5 s
Ran all test suites matching /addNewCourse.early.test.js/i.

C:\Users\jishpatel\jest_ai\LearnIt---Online-Learning-Portal\backend>
```

2) GetAllCourses: -

```
PASS  controllers/course-controller.early.test/getAllCourses.early.test.js
  getAllCourses() getAllCourses method
    Happy Paths
      √ should return a list of courses with status 200 when courses are found (5 ms)
      √ should return an empty list with status 200 when no courses are found
    Edge Cases
      √ should return status 500 when an error occurs during fetching courses (45 ms)

Test Suites: 1 passed, 1 total
Tests:       3 passed, 3 total
Snapshots:   0 total
Time:        1.403 s, estimated 5 s
Ran all test suites matching /getAllCourses.early.test.js/i.

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C:\Users\jishpatel\jest_ai\LearnIt---Online-Learning-Portal\backend>
C:\Users\jishpatel\jest_ai\LearnIt---Online-Learning-Portal\backend>
```

3) GetCourseDetailsByID: -

```
PASS  controllers/course-controller.early.test/getCourseDetailsByID.early.test.js
  getCourseDetailsByID() getCourseDetailsByID method
    Happy paths
      √ should return course details when a valid ID is provided (5 ms)
    Edge cases
      √ should return 404 when course is not found (1 ms)
      √ should return 500 when an error occurs (68 ms)
      √ should handle invalid ID format gracefully (1 ms)

Test Suites: 1 passed, 1 total
Tests:       4 passed, 4 total
Snapshots:   0 total
Time:        1.425 s, estimated 5 s
Ran all test suites matching /getCourseDetailsById.early.test.js/i.

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```

4) UpdateCourseByID: -

```
PASS  controllers/course-controller.early.test/updateCourseByID.early.test.js
  updateCourseByID() updateCourseByID method
    Happy Paths
      √ should update the course successfully and return 200 status (6 ms)
    Edge Cases
      √ should return 404 if the course is not found (2 ms)
      √ should return 500 if there is a server error (60 ms)

Test Suites: 1 passed, 1 total
Tests:       3 passed, 3 total
Snapshots:   0 total
Time:        1.378 s, estimated 5 s
Ran all test suites matching /updateCourseById.early.test.js/i.

C:\Users\jishpatel\jest_ai\LearnIt---Online-Learning-Portal\backend>
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```

- ## Quiz-controller: -

```
PASS  controllers/Instructor/quiz-controller.early.test/addQuiz.early.test.js
  addQuiz() addQuiz method
    Happy Paths
      √ should create a quiz successfully with valid input (5 ms)
    Edge Cases
      √ should return 400 if passingScore is missing (1 ms)
      √ should return 400 if questions are missing (1 ms)
      √ should return 400 if questions is not an array
      √ should return 500 if there is an error saving the quiz (54 ms)

Test Suites: 1 passed, 1 total
Tests:       5 passed, 5 total
Snapshots:   0 total
Time:        1.603 s, estimated 5 s
Ran all test suites matching /addQuiz.early.test.js/i.

C:\Users\jishpatel\jest_ai\LearnIt---Online-Learning-Portal\backend>
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C:\Users\jishpatel\jest_ai\LearnIt---Online-Learning-Portal\backend>
```

- ## List-course: -

```
PASS  controllers/student-controller/List-course.early.test/listCourses.early.test.js
  listCourses() listCourses method
    Happy Paths
      √ should return courses successfully when studentId is valid and courses exist (21 ms)
    Edge Cases
      √ should return 400 error when studentId is missing (18 ms)
      √ should return 404 error when no courses are found for the student (10 ms)
      √ should return 404 error when studentCourses is null (12 ms)
      √ should return 500 error when there is a server error (42 ms)

Test Suites: 1 passed, 1 total
Tests:       5 passed, 5 total
Snapshots:   0 total
Time:        1.738 s, estimated 3 s
Ran all test suites matching /listCourses.early.test.js/i.

C:\Users\jishpatel\unit_final\LearnIt---Online-Learning-Portal-1\backend>
```

- buynow-controller: -

```
PASS  controllers/student-controller/buynow-controller.early.test/buyNow.early.test.js
  buyNow() buyNow method
    Happy Paths
      √ should successfully purchase a course (50 ms)
    Edge Cases
      √ should return 400 if courseId or studentId is missing (4 ms)
      √ should return 404 if course is not found (3 ms)
      √ should return 404 if student is not found (6 ms)
      √ should return 400 if student already enrolled in the course (3 ms)
      √ should return 500 on server error (31 ms)

Test Suites: 1 passed, 1 total
Tests:       6 passed, 6 total
Snapshots:   0 total
Time:        1.753 s, estimated 3 s
Ran all test suites matching /buyNow.early.test.js/i.

C:\Users\jishpatel\unit_final\LearnIt---Online-Learning-Portal-1\backend>
```

- Controller_at_student: -

```
PASS  controllers/student-controller/course-controller.early.test/getStudentViewCourseDetails.early.test.js
  getStudentViewCourseDetails() getStudentViewCourseDetails method
    Happy Paths
      √ should return course details when a valid course ID is provided (6 ms)
    Edge Cases
      √ should return 404 when the course is not found (1 ms)
      √ should return 500 when there is an error fetching course details (43 ms)
      √ should handle invalid course ID format gracefully (2 ms)

Test Suites: 1 passed, 1 total
Tests:       4 passed, 4 total
Snapshots:   0 total
Time:        1.454 s, estimated 3 s
Ran all test suites matching /getStudentViewCourseDetails.early.test.js/i.

C:\Users\jishpatel\jest_ai_3\LearnIt---Online-Learning-Portal\backend>
```

- **<u>Coverage of Each Test File:</u>**

- Login and Register controller Coverage:

All files controllers

100% Statements 32/32   **90%** Branches 9/10   **100%** Functions 2/2   **100%** Lines 32/32
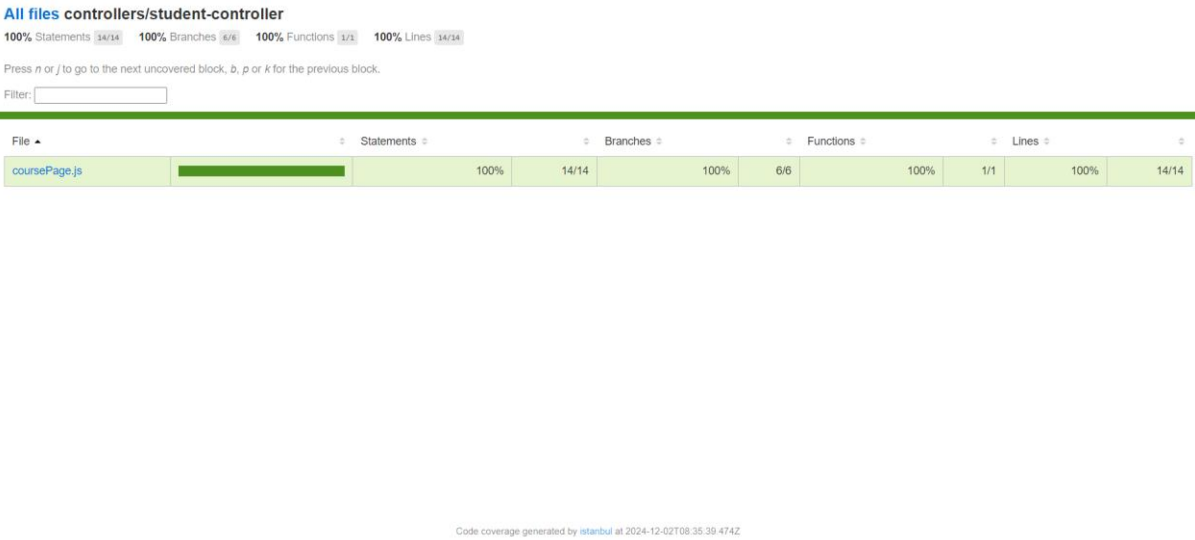
Press *n* or *j* to go to the next uncovered block, *b, p* or *k* for the previous block.

Filter:

File ▲		Statements			Branches			Functions			Lines	
loginUser.js			100%	14/14		100%	4/4		100%	1/1	100%	14/14
registerUser.js			100%	18/18		83.33%	5/6		100%	1/1	100%	18/18

Code coverage generated by istanbul at 2024-12-02T08:41:57.701Z

- Student-course-controller Coverage:

All files controllers/student-controller

100% Statements 11/11   **100%** Branches 2/2   **100%** Functions 1/1   **100%** Lines 11/11

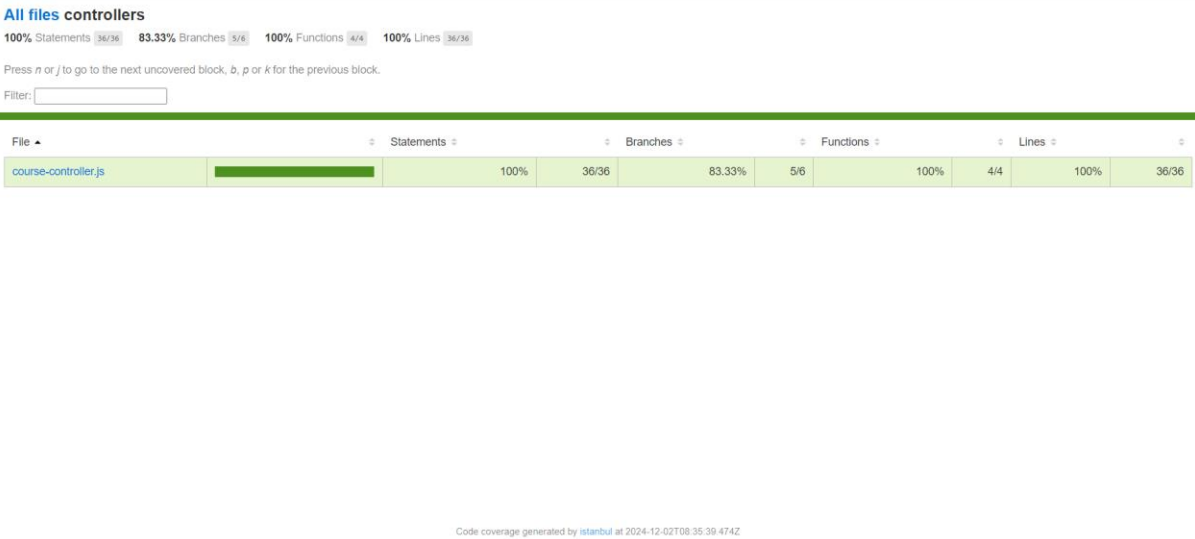Press *n* or *j* to go to the next uncovered block, *b, p* or *k* for the previous block.

Filter:

File ▲		Statements			Branches			Functions			Lines	
course-controller.js			100%	11/11		100%	2/2		100%	1/1	100%	11/11

Code coverage generated by istanbul at 2024-12-02T08:41:57.701Z

- Course-page controller Coverage:

- Course-controller Coverage:

- List-Course and Buy-now controller Coverage:

All files controllers/student-controller

95.91% Statements 47/49   **90%** Branches 18/20   **100%** Functions 3/3   **95.91%** Lines 47/49

Press *n* or *j* to go to the next uncovered block, *b*, *p* or *k* for the previous block.

Filter:

File ▲		Statements		Branches		Functions		Lines	
List-course.js		100%	16/16	100%	6/6	100%	1/1	100%	16/16
buynow-controller.js		93.93%	31/33	85.71%	12/14	100%	2/2	93.93%	31/33

Code coverage generated by istanbul at 2024-12-02T15:09:23.746Z

Each of this coverage file and test-case files are uploaded on GitHub.