



MERN STACK POWERED BY MONGO DB

Online Book Store

A Project Report

Submitted by

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1. INTRODUCTION

The **Online Bookstore Project** is a web-based application built using the **MERN stack** (MongoDB, Express.js, React, and Node.js). It serves as an e-commerce platform where users can explore, purchase, and review books in a streamlined and interactive manner. This project was developed as part of our academic coursework, showcasing our skills in full-stack development and teamwork.

The platform features an intuitive and user-friendly interface, ensuring a smooth browsing experience for book enthusiasts. Users can easily navigate through categories, search for specific titles, view detailed book descriptions, and add items to their shopping cart. Responsive design principles were implemented to ensure compatibility across various devices, enhancing accessibility for all users.

On the backend, the project employs secure authentication and authorization mechanisms to protect user data. It incorporates RESTful APIs for efficient communication between the frontend and backend, supporting functionalities like user registration, login, order management, and reviews. A well-structured database in MongoDB manages the storage of books, user profiles, orders, and reviews.

The development of this project allowed our team to work collaboratively, dividing tasks effectively to manage both technical and design challenges. By leveraging modern tools and best practices, we ensured the application was scalable, secure, and easy to maintain. Each feature was designed with the enduser in mind to provide a seamless and enjoyable experience.

This project not only demonstrates our technical expertise but also lays the foundation for future enhancements. Potential additions include personalized recommendations, advanced search filters, and integration with a mobile app to broaden the platform's reach. The **Online Bookstore** reflects our dedication to building meaningful, real-world applications through innovative and collaborative efforts.

2. PROJECT OVERVIEW

Purpose

The primary goals are to provide users with an intuitive platform to browse, search, and purchase books while streamlining inventory management and order processing for bookstore administrators. The project serves as a modern, digital alternative to traditional bookstores, bringing convenience and accessibility to book enthusiasts.

Features

- 1. **Personalized Recommendations**: A recommendation engine that suggests books to users based on their browsing history, purchases, and ratings, enhancing the user experience.
- 2. **Book Reviews and Ratings**: Users can leave reviews and rate books, providing valuable feedback and helping others make informed purchasing decisions.
- 3. **Secure Payment Integration**: Integration with secure payment gateways like Stripe or PayPal, allowing users to make transactions safely and conveniently.
- 4. **Notification System**: Email or in-app notifications for order confirmation, shipment updates, and new arrivals or promotions.
- 5. **Customer Support Chat**: An integrated chatbot or live chat feature to assist users with questions, order issues, or general inquiries in real-time.

- 6. **Wishlist Functionality**: Users can save books to a wishlist for future reference, making it easier to track items of interest.
- 7. **Advanced Search Filters**: Allow users to filter books by genre, author, price range, and ratings for a more tailored search experience.
- 8. **Discount and Promotions**: Incorporate discount codes, seasonal offers, and loyalty programs to attract and retain customers.
- 9. **Dark/Light Mode Toggle**: Provide an option for users to switch between dark and light themes for better usability and comfort.
- 10.**Multi-Language Support**: Enable users to choose from multiple languages, making the platform more inclusive for a global audience.
- 11.**Admin Dashboard**: A dedicated dashboard for administrators to manage books, track orders, view user activity, and analyze sales data effectively.

3. ARCHITECTURE

Frontend - React

Framework: Built with React for a dynamic and responsive user interface.

Reusable Components:

Navbar: For app-wide navigation links.

BookList: Displays available books with filtering and sorting options.

BookDetail: Shows detailed information about each book, including reviews.

ShoppingCart: Manages selected items, showing totals and checkout options.

State Management: Uses Context API or Redux to manage user and cart state across the app.

Routing: React Router enables seamless navigation between pages (Home, Book Details, Cart, Profile, etc.).

API Integration: Axios or Fetch API handles communication with backend endpoints.

CSS Frameworks: Bootstrap or Tailwind CSS for responsive and mobile-friendly design.

Custom Hooks: Reusable logic for data fetching and authentication, ensuring modularity.

Backend - Node.js & Express

RESTful API: Provides structured endpoints for managing core resources:

/api/books for book data

/api/users for user management /api/orders

for cart and order processing

/api/reviews for book reviews and ratings

Security:

JWT Authentication: Ensures secure access to protected routes.

Middleware: Custom middleware for error handling and validation (e.g., user input).

Payment Gateway Integration: Integrates Stripe for secure payment handling during checkout.

Environment Configuration: Sensitive data (e.g., database URI, API keys) stored in environment variables

Database - MongoDB

Database Structure:

Users Collection: Contains usernames, emails, hashed passwords, and order history.

Books Collection: Stores book titles, authors, prices, descriptions, and inventory.

Orders Collection: Holds user orders, items, total cost, and order statuses.

Reviews Collection: Links users to book reviews with ratings and comments.

Mongoose ORM:

Defines schemas for each collection, enforces data types and relationships.

Relationships:

ObjectIds create references between collections (e.g., linking reviews to books, orders to users).

Data Retrieval:

Efficient querying for complex data (e.g., fetching all reviews for a book or all orders for a user).

4.SETUP INSTRUCTIONS

Prerequisites

Make sure to have the following software installed:

- · Node.js
- · MongoDB
- · Git

Installation

- 1. Clone the Repository
- 2. Install Dependencies o Backend

```
cd backend npm
```

install

o Frontend

cd /frontend npm

install

3. Dependencies

```
Front end dependencies":

{
    "axios": "^1.6.2",
    "bootstrap": "^5.3.2",
    "react": "^18.2.0",
    "react-bootstrap": "^2.9.1",
    "react-dom": "^18.2.0",
    "react-icons": "^4.12.0",
```

```
"react-router-dom": "^6.19.0",

"recharts": "^2.10.1",

"tailwindcss": "^3.3.5"

Backend

"dependencies": {

   "cors": "^2.8.5",

   "express": "^4.18.2",

   "mongo": "^0.1.0",

   "mongodb": "^2.0.0",

   "mongodb": "^6.10.0",

   "mongoose": "^8.0.1",

   "multer": "^1.4.5-lts.1",

"nodemon": "^3.0.1"
```

4. Environment Variables

In the **backend** folder, create a .env file with:

MONGO_URI=your-mongodb-url
JWT_SECRET=your-jwt-secret

5. Run the Application

Start both the backend and frontend servers cd backend && npm start cd

/frontend && npm start

5. FOLDER STRUCTURE

Client - React Frontend

· src:

The root directory for the React application containing all core code.

components:

Houses reusable, modular UI elements such as:

Navbar: Navigation bar for browsing categories, login/logout, and cart access.

BookList: Displays a grid of books with options to filter by genre or author.

BookDetail: Shows detailed information about a selected book, including reviews and ratings.

ShoppingCart: Manages and displays items added by the user, with options to modify quantities or proceed to checkout.

pages:

Contains the complete pages of the application, mapping to specific routes:

o HomePage: Displays featured books, categories, and promotional offers. o BookPage: Lists all books with sorting and filtering options. o CartPage: Showcases the shopping cart and checkout process. o ProfilePage: Allows users to view and update their profile information and order history.

· context:

Includes context providers to manage global state:
Ohead AuthContext:

Manages authentication state, such as logged-in user info.

• CartContext: Tracks items in the user's cart and calculates totals.

hooks:

Stores custom reusable hooks for specific logic, such as: o

useFetchBooks: Handles API calls to fetch book data. ∘

useAuth: Manages login state and token validation.

· services:

Encapsulates API interaction logic using **Axios** or **Fetch** to ensure clean code, including endpoints for books, users, and orders.

· App.js:

The central application component that defines the app's structure, handles routing with **React Router**, and sets up layout components like footers and headers.

• index.js:

The entry point for the application, rendering the React app into the DOM.

Server - Node.js Backend

• controllers:

Contains logic for managing requests and responses:
o bookController: Handles CRUD operations for books and fetches detailed information.
o userController: Manages user registration, login, profile updates, and authentication.
o orderController: Handles placing, updating, and tracking orders.
o models:

Defines **Mongoose** schemas and models for MongoDB collections:

- User Model: Includes fields like username, email, hashedPassword, and order history.
- Book Model: Stores book information such as title, author, genre, price, and inventory.

Order Model: Tracks userId, items, totalCost, and orderStatus. • **Review Model**: Links user reviews to books via ObjectId references.

· routes:

Defines RESTful API endpoints for resources: o **bookRoutes**: Handles endpoints like /api/books for retrieving and managing books. o

userRoutes: Includes routes for authentication and user profile management. • **orderRoutes**: Manages order placement and tracking.

middleware:

- Authentication Middleware: Verifies JWTs to protect sensitive routes.
- Error Handling Middleware: Catches errors and sends standardized responses.
 Validation Middleware: Validates incoming data, such as user input on forms.

config:

Stores configurations such as MongoDB connection strings, JWT secrets, and other environment variables.
 Leverages dotenv to securely manage sensitive settings.

6. RUNNING THE APPLICATION

To start the application locally, use the following commands:

Frontend

Navigate to the frontend directory and start the React app:

cd client

npm start

· Backend

Navigate to the backend directory and start the server:

cd server npm start

Verify the Setup

- 1. Open a browser and navigate to http://localhost:5173 to access the frontend of the **Online Bookstore**.
- 2. Test key functionalities:
 - User registration and login.
 - Browsing the book catalog and viewing book details.
 Adding books to the shopping cart and proceeding with the checkout process.
 - Admin functionalities such as managing inventory and processing orders, if applicable.

7. API DOCUMENTATION

Admin Endpoints (Located in backend/admin)

1.Admin Login

```
Endpoint: /admin/login

Method: POST

Description: Authenticates an admin user.

Request Parameters:

username (string, required) password
(string, required)

Example Response:

{

"message": "Admin login successful",

"admin": {

"id": "1",

"username": "admin123"}

}
```

Seller Endpoints (Located in backend/seller)

1. Add Book

```
Endpoint: /seller/add-book
```

Method: POST

Description: Adds a book for sale by a seller.

Request Parameters:

title, author, price, description, etc.

Example Response:

```
{"message": "Book added successfully",
  "book": {
    "id": "101",
    "title": "Sample Book" }
```

2. View My Products

Endpoint: /seller/my-products

Method: GET

Description: Retrieves all books listed by the seller.

Example Response:

User Endpoints (Located in backend/user)

1.User Sign-up

Endpoint: /user/signup

Method: POST

Description: Registers a new user.

Request Parameters:

username, email, password, etc.

Example Response:

```
"message": "User registered successfully",
   "user": {
     "id": "201",
     "username": "user123"
     }
}
```

2. View Wishlist

Endpoint: /user/wishlist

Method: GET

Description: Retrieves the wishlist for the user.

Example Response:

8. AUTHENTICATION

JWT (JSON Web Tokens) Authentication

- The project uses **JWT tokens** to securely authenticate users. When
 a user logs in, the backend generates a JWT and sends it back to the
 client.
- This token is stored securely on the client side (in localStorage or sessionStorage) and is included in the headers of future requests to access protected resources.
 JWT tokens have a limited validity period for security. When expired, the user needs to log in again to obtain a new token.
- o **Token Refresh Mechanism**: Implementing a refresh token system ensures users don't get logged out abruptly, enhancing user experience while maintaining security.

2. Authorization

- Role-Based Access: The backend checks user roles (regular user vs. admin) to restrict access to certain actions:
 - + Users can browse books, add reviews, and place orders.
 - + Admins can add, update, or delete book entries and manage orders.
- o **Middleware**: Middleware functions in the backend validate the JWT on each request to ensure that only authenticated users can access protected routes (e.g., order history, checkout).
- Granular Permissions: Additional layers of permissions ensure that even within admin roles, certain actions (like deleting orders or books) can be restricted to specific users.

3. Session Management

- o JWT-based authentication does not require server-side session storage, making the app scalable. Each request includes the JWT, which is verified by the server without the need to maintain sessions.
- Tokens are securely stored on the client side, avoiding cookies to reduce vulnerability to Cross-Site Request Forgery (CSRF) attacks.
 - Logout Mechanism: A simple token invalidation mechanism (e.g., clearing the stored JWT) ensures proper session termination.

4. Security Measures

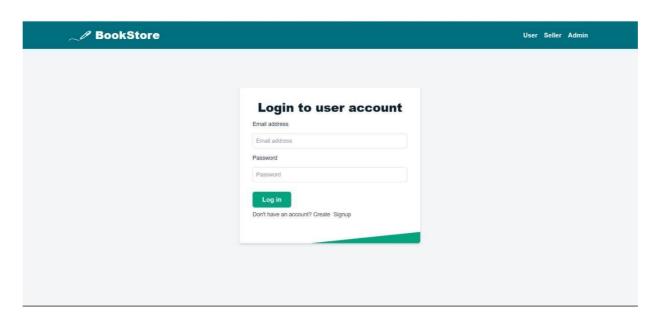
- o **Password Hashing**: User passwords are securely hashed using strong algorithms like bcrypt before storage in the database, preventing unauthorized access in case of data leaks.
- Environment Variables: Sensitive keys, like the JWT secret and database URI, are stored in environment variables to avoid exposing them in the codebase.
- Data Validation: Input validation using libraries like Joi or expressivalidator ensures that data sent to the server is clean and prevents injection attacks.
- Rate Limiting and IP Blocking: The backend implements rate limiting to prevent brute-force login attempts and temporarily blocks IPs after multiple failed attempts.
- HTTPS: Secure connections are enforced to protect data transmitted between the client and server, safeguarding sensitive information like login credentials and payment details.

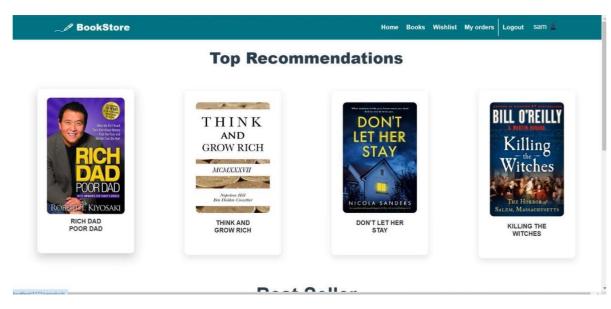
5. Error Handling and Feedback

 Clear error messages are provided for failed authentication or authorization attempts, improving user experience and debugging.

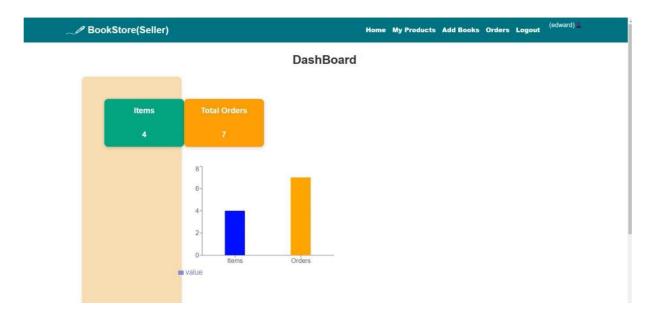
9. USER INTERFACE

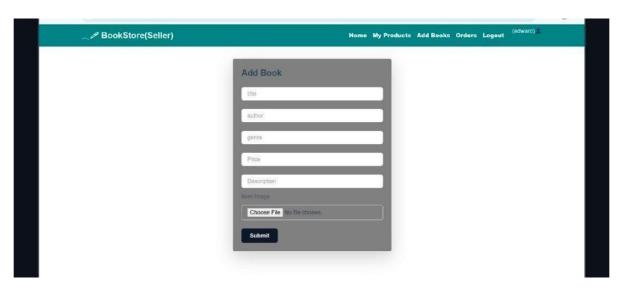
The overall UI adopts a minimalist approach, reducing clutter and focusing on essential content. This not only improves usability but also ensures a faster, more enjoyable browsing experience.

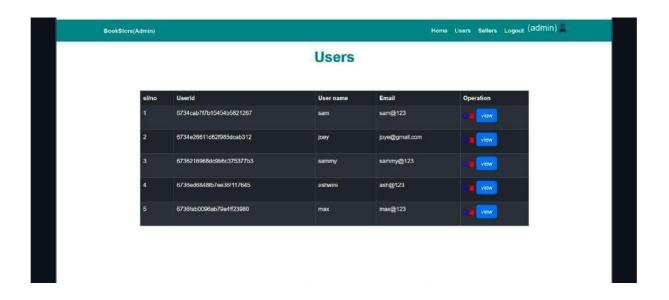




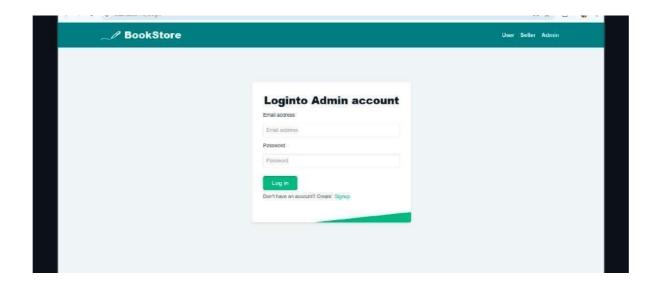
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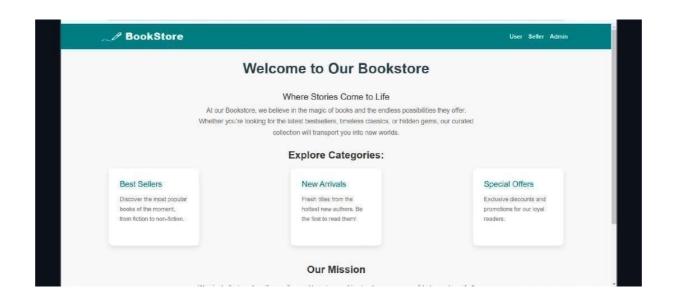






The interface is designed with simplicity and usability in mind, ensuring that users can easily navigate through the bookstore without confusion. The **Navbar** offers clear categories for browsing books (e.g., genres, authors), user profile management, and shopping cart. It helps users quickly find what they're looking for.





Complete demonstration of our online book store project - https://drive.google.com/file/d/1zwsT6lNHBgIRCfqVjMsP2ZbPiuekeiXY/view?us p=drivesdk

10.

TESTING

Testing

1. Unit Testing with Jest (for Cart Functionality)

Unit testing ensures the correctness of individual components or functions.

cart.js (Functionality)

```
let cart = [];
const addToCart = (book) => {
  cart.push(book);
};
const getTotalPrice = () => { return cart.reduce((total, item) => total + item.price, 0);
}; const getCart = () => cart;

module.exports = { addToCart, getTotalPrice, getCart };
```

Running Unit Tests with Jest

```
Install Jest:
```

npm install --save-dev jest

Run the test: npm test

2. End-to-End Testing with Cypress (for Checkout Process) End-to-end testing ensures the entire flow works as expected. describe('Online

```
Bookstore - Checkout Flow', () => { beforeEach(() => { cy.visit('http://localhost:5173'); // Ensure the app is running locally
```

```
});
 it('should allow a user to add a book to the cart and proceed to checkout', () =>
  // Add a book to the cart cy.get('.book-item').first().click(); //
Select the first book in the list
                                 cy.get('.add-to-cart').click(); //
Button to add to cart
  //
        Verify
                   that
                           the
                                           shows
                                                      the
                                                             added
                                                                        book
                                   cart
cy.get('.cart').should('contain', 'Book Title'); // Example book title
  // Proceed to checkout
                                         cy.get('.checkout-
button').click(); // Checkout button
  // Fill in checkout details (mock data) cy.get('.checkout-form
input[name="name"]').type('Jane Doe'); cy.get('.checkout-form
input[name="address"]').type('456 Elm St');
  cy.get('.checkout-form input[name="payment"]').type('411111111111111); //
Test credit card number
  cy.get('.checkout-form button[type="submit"]').click();
  cy.url().should('include', '/order-confirmation');
                                                    cy.get('.order-
summary').should('contain', 'Thank you for your purchase'); });
});
```

3. Security Testing: SQL Injection Vulnerability

Testing ensures inputs are sanitized to prevent SQL injection attacks.

4. Performance Testing with Lighthouse (CLI)

Performance testing checks page load times, accessibility, and other metrics.

Run the test: npx lighthouse http://localhost:5173 --output html --output-path ./lighthousereport.html

11.KNOWN ISSUES

1.Limited Error Handling on Checkout

During the checkout process, errors from the payment gateway (e.g., declined card) may not be fully detailed for the user. Enhanced error messaging and handling are planned for the next release.

2. Mobile Responsiveness

While the app is largely responsive, some components, like the shopping cart and order history pages, may not display optimally on smaller screens. Further CSS adjustments are scheduled to improve mobile compatibility.

3. Browser Compatibility

Certain UI elements may not display correctly in older versions of Internet Explorer. It is recommended to use a modern browser (Chrome, Firefox, or Edge) for the best experience.

4. Session Expiry Notifications

When a user's session expires (e.g., JWT token expiration), they are logged out without a prior warning, which may interrupt their workflow. A session expiry warning system is being considered to provide a smoother user experience.

5. Database Performance with Large Datasets

As the database grows, queries for certain operations, such as retrieving order history or applying complex filters to books, may experience slight delays. Indexing and database optimization techniques are being explored to enhance performance for large-scale data.

6. Review Moderation

Currently, user-submitted reviews are displayed instantly without admin oversight. This leaves the system vulnerable to spam or inappropriate content. A moderation queue and flagging system are planned for future implementation.

7. Search Functionality Limitations

The search feature lacks advanced capabilities like filtering by multiple criteria (e.g., price range, genre, and author simultaneously). A more robust search algorithm and additional filters are planned for future versions.

8. Limited Accessibility Features

While the application provides basic accessibility, it lacks comprehensive ARIA (Accessible Rich Internet Applications) roles, keyboard navigation, and screen reader support in some areas. Accessibility improvements are a high-priority task for the next development cycle.

12.FUTURE ENHANCEMENT

1. Advanced Search and Filtering

o Implement a robust search functionality that enables users to filter books by various criteria such as genre, author, price range, publication year, and user ratings. This will significantly improve the ease of finding desired books.

2. Personalized Recommendations

 Integrate a machine learning-based recommendation engine that suggests books based on user reading habits, browsing history, purchase trends, and popular books, creating a more tailored user experience.

3. Multi-Language Support

o Introduce multi-language support to cater to a global audience. This would allow users to interact with the platform in their preferred language, improving accessibility and inclusivity.

4. Enhanced Security Measures

 Strengthen security with advanced features like two-factor authentication (2FA), biometric login for mobile users, and fraud detection mechanisms to ensure user data and transactions remain secure.

5. Mobile App Version

Develop native mobile applications for iOS and Android platforms.
 The apps would provide seamless access to the bookstore on the go, with features optimized for mobile devices, such as push notifications for promotions and new arrivals.

6. Subscription Plans for Exclusive Content

 Offer subscription plans that provide users with benefits like early access to new releases, exclusive discounts, or access to premium content like audiobooks and eBooks.

7. AI-Powered Chat Support

o Implement an AI-driven chatbot to assist users with common queries, such as searching for books, tracking orders, and troubleshooting account issues, ensuring round-the-clock support.

8. Integration with Social Media

 Allow users to share reviews, book lists, or favorite books directly on social media platforms, enhancing community engagement and attracting more users to the platform.

9. Bulk Order and Corporate Accounts

o Introduce features for corporate accounts and bulk book orders, catering to organizations, educational institutions, and libraries.

10. Gamification Features

 Add gamification elements, such as rewarding users with points for purchases, reviews, or referrals, which can be redeemed for discounts or special offers, encouraging more interaction.