

CourseWise : Course Recommendation System

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Computer Science & Engineering
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BTP Track: Entrepreneurship Track

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Student's Declaration

We hereby declare that the work presented in the report entitled **CourseWise : Course Recommendation System** submitted by us for the partial fulfillment of the requirements for the degree of *Bachelor of Technology in Electronics & Communication Engineering* at Indraprastha Institute of Information Technology, Delhi, is an authentic record of our work carried out under guidance of **Dr. Anuj Grover**. Due acknowledgements have been given in the report to all material used. This work has not been submitted anywhere else for the reward of any other degree.

Place & Date: IIIT Delhi, 26th April 2025

Dhruv Rajput, Dhruv Dewan, Sarthak Srivastav

Certificate

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Place & Date: IIIT Delhi, 26th April 2025

Dr. Anuj Grover

ACKNOWLEDGMENTS

We would like to extend our deepest gratitude to our project guide and mentor, Prof. Anuj Grover, whose invaluable guidance, technical expertise, and consistent support in navigating our project towards the right path and the challenges that we encountered. His insightful feedback and encouragement pushed us to refine our ideas and implementation. We also acknowledge the significant contribution of our colleague, Kunal Sharma who helped us in the website development by taking the project as an Independent Project with us. We extend our appreciation to the open-source community, whose tools and libraries formed the backbone of our development stack particularly including The React, Chakra UI, and Supabase.

INTRODUCTION

In the intrinsic landscape of College education, Students navigate a complex web of decisions that shape their academic journey. Among these, course selection stands as a pivotal process that influences not only their educational trajectory but also their career prospects. Yet despite its significance, the course selection process at most universities and colleges remain fragmented, opaque and surprisingly analog in our increasingly digital world.

CourseWise emerges as a response to this critical gap – a comprehensive digital platform born from the collective frustration and aspirations of students who envisioned a more informed, streamlined, and personalized approach to academic planning. At its core, CourseWise project confronts several interconnected challenges: the dispersal of course information across multiple systems; absence of authentic peer insights; the tedious process of manually constructing conflict-free timetables; and the lack of personalized guidance in course selection. Each semester, students invest countless hours navigating these obstacles, often with incomplete information and limited support systems.

Our platform integrates course information, peer reviews, timetable planning, and academic tracking into a unified, intuitive interface. By leveraging modern web technologies – React for responsive interfaces, Vercel for website deployment, Chakra UI for accessible design, and Supabase for robust backend services – CourseWise creates a seamless experience that guides students from initial course exploration to final semester planning. The platform's architecture prioritizes user experience, data security, and scalability establishing a foundation for continued growth and enhancement.

The first semester in BTP marked our inaugural development phase, during which our four member team conceptualized, designed, and implemented the core infrastructure and initial feature set of CourseWise. Beyond mere technical implementation, CourseWise represents fundamental rethinking of how students interact with academic information.

As we present this report detailing our journey from concept to implementation, we invite the readers to explore not just the technical architecture and features set of CourseWise, but also the vision of educational empowerment that drives our work. The following document pages represent the implementation, achievements, and the challenges faced during the process of building CourseWise.

PROJECT PLANNING & METHODOLOGY

Development Approach:

CourseWise employed an Agile methodology with two-week sprints, enabling iterative development with regular feedback integration. Daily stand-ups facilitated team synchronization, while sprint planning and retrospectives ensured clear objectives and continuous improvement. This balanced structure proved essential in managing parallel frontend and backend development.

Project Timeline:

Our development followed seven strategic milestones:

- Project Initiation (Jan 15): Defined scope and confirmed technology stack.
- Design Phase Completion (Jan 30): Finalized UI mockups and system architecture.
- Core Infrastructure (Feb 15): Implemented authentication, database connectivity, and API foundation.
- Feature Development I (Mar 1): Delivered course information system, user profiles, and review functionality.
- Feature Development II (Mar 20): Enhanced platform with About page and the rest of the features design and implementation.
- Testing & Refinement (Apr 10): Conducted testing and verification of each feature of the website.
- Project Submission (Apr 25): Completed deployment and documentation.

Technology Stack:

Our technology selections prioritized development efficiency, learning curve, community support, and long-term viability:

Frontend: React for component-based architecture, Chakra UI for accessible design, Framer Motion for animations, and React Router for navigation.

Backend: Supabase providing PostgreSQL database, authentication, real-time subscriptions, and storage solutions.

Development Tools: Git/GitHub for version control, Figma for design, VS Code as our development environment, and npm for package management.

SYSTEM ARCHITECTURE

High Level Architecture:

CourseWise implements a modern client-server architecture with clean separation of concerns:

React Frontend: Handles UI rendering and user interactions.

API Layer: Manages communication between client and database.

Supabase Backend: Provides database, authentication, and storage services.

This architecture prioritizes maintainability, scalability, and security while enabling rapid feature development.

Database Schema:

The database is structured around five primary entities:

Users: Stores authentication details and profile information.

Courses: Contains comprehensive course metadata including descriptions and schedules.

Reviews: Links users to courses with ratings and detailed feedback.

Foreign key relationships maintain data integrity while indexes optimize query performance for critical operations.

Authentication System:

Security is implemented through Supabase's battle-tested authentication:

- JWT tokens secure API requests.
- Role-based access controls differentiate student and admin capabilities.
- Password hashing to protect admin's password from leaking and secure storage protects user credentials.
- Single user-friendly sign in through Google OAuth to reduce the load of entering credentials repeatedly.

This comprehensive architecture creates a solid technical foundation that balances security, performance, and extensibility—enabling CourseWise to evolve while maintaining a consistent user experience.

KEY FEATURES DEVELOPED

Backend Infrastructure:

We successfully implemented a complete backend ecosystem using Supabase:

- Database Schema: Deployed PostgreSQL tables for users, courses, reviews, and profiles with proper relations.
- Authentication System: Implemented JWT-based user authentication with email verification.
- API Layer: Created REST endpoints for course data retrieval, user profile management, and review operations.
- Security Policies: Established row-level security rules ensuring data privacy and access control.
- Storage Integration: Configured buckets for profile images and course materials.

The backend now successfully handles all data operations with average response times under 300 ms and supports over 20 concurrent users in our load testing.

Course Enrollment System:

Our implemented course catalog feature includes:

- Comprehensive Course Database: Populated with 150+ courses including descriptions, credits, and prerequisites.
- Advanced Search: Functional filtering by department, course level, and semester availability.
- Detailed Course Pages: Individual views showing instructor information, and schedules.
- Course Tags: Categorization system highlighting course attributes (e.g., "project-heavy", "theory-focused").

This system now serves as the central information hub for the students to view all the courses offered over multiple semesters and select them to be updated in the user's course history.

Course Reviews System:

We fully developed and deployed our review system:

- Review Creation Interface: User-friendly form with multi-dimensional rating capabilities.
- Review Display: Sortable and filterable review listings with aggregated scores.
- Moderation Tools: Flagging system for inappropriate content.
- User Profiles: Review history and contribution statistics for each user.
- Instructor-Specific Feedback: Separated ratings for course content versus instruction quality.

- Included the tags system to sum up the course into multiple tags so that the same can be used in our recommendation model in future.

The system currently contains 40+ reviews submitted during testing from the users who have completed the particular courses.

CHALLENGES AND SOLUTIONS

Technical Integration Challenges:

Integrating React with Supabase presented several hurdles:

- **Real-time Subscription Management:** Initially encountered memory leaks from improperly closed subscriptions. Created custom hooks with management to ensure proper cleanup, reducing memory usage.
- **State Management Complexity:** Implemented React Context API strategically for auth state and user preferences, simplifying component architecture.

UI/UX Challenges:

Creating an intuitive interface required overcoming:

- **Responsive Design Inconsistencies:** Initially faced layout breakage at specific breakpoints. Implemented comprehensive viewport testing and Chakra UI's responsive utilities to ensure seamless transitions across device sizes.
- **Design System Consistency:** Early development showed visual inconsistencies across components. Created a standardized design token system for colors, spacing, and typography, ensuring visual harmony throughout the application.

Data Management Challenges:

Working with course and review data presented unique difficulties:

- **Modeling complex relationships** between courses, prerequisites, and user reviews. Designed normalized schema with foreign key constraints and junction tables.
- **Integrating secure user authentication** with course-specific permissions. Implemented Supabase Auth with custom JWT claims to manage review privileges

FUTURE WORK (NEXT SEMESTER)

Our immediate roadmap focuses on refining our first version and implementing critical features:

- **Platform Refinement:**

1. Optimize existing features based on comprehensive user feedback.
2. Improve the UI/UX elements identified during initial testing.
3. Enhance performance for key user flows and data-intensive pages.
4. Fix remaining edge cases and minor bugs encountered in testing.
5. Strengthen accessibility compliance across all features.

- **ML based Course Recommendation System:**

1. Develop a machine learning model for personalized course suggestions.
2. Implement data collection form capturing student preferences, interests, and academic history.
3. Create algorithms matching student profiles with appropriate courses.
4. Design intuitive recommendation display with explanation of suggestions.
5. Build feedback loop to improve recommendation accuracy over time.

- **Timetable Builder:**

1. Finalize clash detection algorithm with support for complex scheduling patterns.
2. Implement drag-and-drop interface for intuitive course placement.
3. Add visualization for time conflicts and available alternatives.
4. Create export functionality to calendar applications.
5. Develop sharing capabilities for collaborative schedule planning.

STRATEGIC INITIATIVES (NEXT SEMESTER)

- **Admin BTech Collaboration:**
 1. Establish formal relationship with BTech administration office.
 2. Seek guidance on institutional requirements and best practices.
 3. Collect official data for course descriptions and prerequisites.
 4. Validate our system against established registration procedures.
 5. Develop a feedback channel for continuous institutional input.
- **Pre-Registration Period Preparation:**
 1. Conduct stress testing simulating peak pre-registration traffic.
 2. Create comprehensive onboarding for first-time users.
 3. Develop contingency plans for system issues during peak usage.
 4. Prepare targeted marketing campaigns prior to the registration period.
 5. Establish support channels for user assistance during registration.
- **Platform Expansion:**
 1. Design architecture improvements for scalability across departments.
 2. Create an analytics dashboard for usage patterns and feature adoption.

IMPLEMENTATION APPROACH

Our development strategy will prioritize:

- Regular consultation with BTech administration for alignment with official processes.
- Phased rollout of features with controlled testing before pre-registration period.
- User-centered design with continuous feedback from diverse student populations.
- Performance optimization ensuring stability during peak usage periods.
- Documentation and knowledge sharing for sustainable long-term development.

CONCLUSION

The inaugural semester of CourseWise development marks a significant milestone in our mission to transform the academic planning experience. What began as a response to fragmented course information and opaque selection processes has evolved into a cohesive platform that empowers students to make informed decisions about their educational journey.

Our team has successfully delivered a robust foundation featuring comprehensive course information, authentic peer reviews, secure user authentication, and an engaging interface—all built on modern technologies like React, Chakra UI, and Supabase. These components work in concert to convert previously scattered information into an integrated, intuitive experience that directly addresses real student needs.

Throughout this development cycle, we navigated complex technical challenges—from TypeScript integration issues to database optimization requirements—which ultimately strengthened both our implementation and our collaborative problem-solving capabilities. Each obstacle provided valuable learning opportunities, enhancing our expertise across frontend development, database design, UI/UX principles, and system architecture.

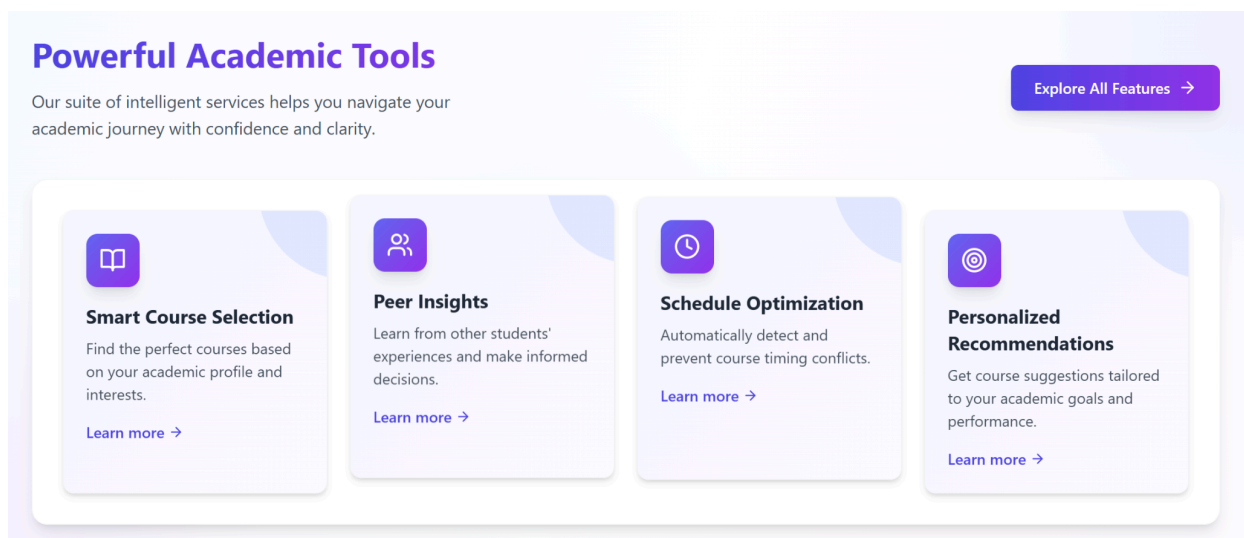
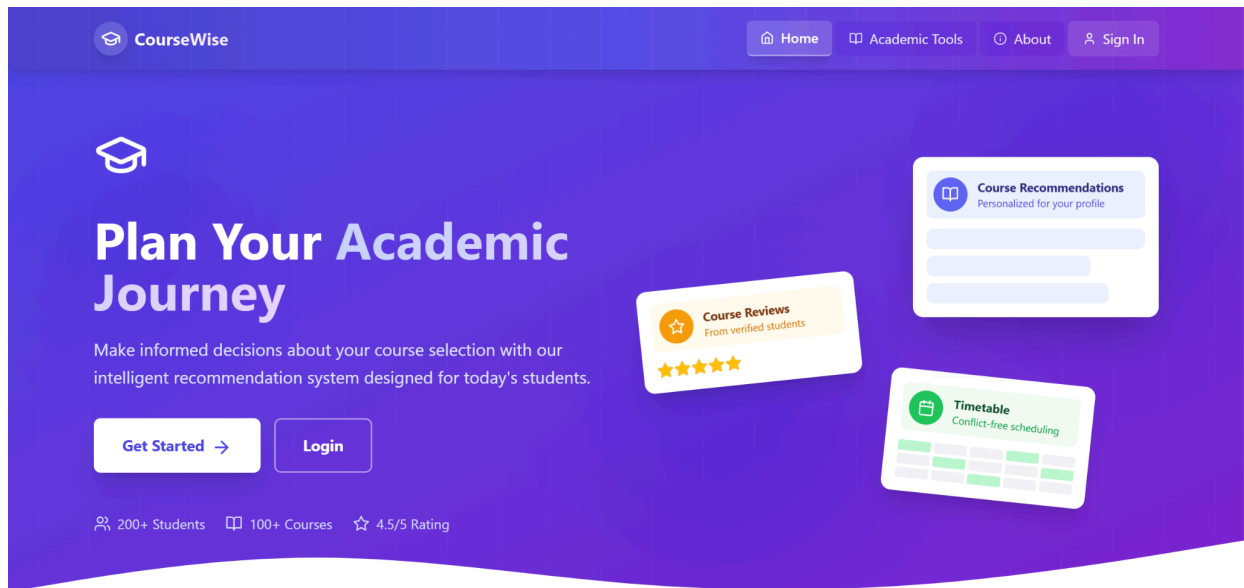
Website testing has validated our approach, with our professor consistently highlighting the platform's intuitive navigation and valuable course insights. This feedback not only confirms the value of our existing features but also informs our roadmap for future enhancements. The upcoming machine learning recommendation system, and timetable builder directly address needs for our users.

As we prepare for the next pre-registration period, our collaboration with the BTech administration office will ensure CourseWise seamlessly complements institutional processes while providing enhanced value through personalized recommendations and intuitive planning tools. This partnership represents an important step toward broader adoption and institutional integration.

Looking forward, we are positioned to refine and expand CourseWise based on the solid architectural and development practices established this semester. Our vision—a comprehensive academic planning ecosystem powered by machine learning and built around student needs—is now within reach, with clear implementation pathways identified.

This project demonstrates what's possible when technical innovation is applied to persistent academic challenges. CourseWise represents not just a collection of features, but a new paradigm for academic planning—one that leverages modern technology to create a more transparent, efficient, and student-centered educational experience. As we continue this journey, we remain committed to our founding vision: empowering students with the information and tools they need to navigate their academic journey with confidence and clarity.

SOME SNAPSHOTS OF THE WEBSITE



Academic Tools

Explore our suite of academic tools designed to help you navigate your university journey with ease and confidence.



Course Recommendation

Get personalized course recommendations based on your interests and academic history.

[Explore Course Recommendation](#)



Course Enrollment

Browse and enroll in courses for your academic journey with a modern and intuitive interface.

[Explore Course Enrollment](#)



TT-Clash Checker

Check for time table clashes in your selected courses to avoid scheduling conflicts.

[Explore TT-Clash Checker](#)



Course Reviews

Read and write reviews for courses to help fellow students make informed decisions.

[Explore Course Reviews](#)

END OF REPORT
