**Course Registration and Scheduling System**

**📌 Project Overview**

The **Course Registration and Scheduling System** is a **web-based application** designed to streamline the university course enrollment process, ensuring a smooth and efficient experience for both **students** and **administrators**. The system prevents scheduling conflicts, provides real-time seat availability, and offers an intuitive weekly **schedule visualization** to help students make informed course selections.

**🎯 Objectives & Key Features**

**🔹 For Students**

✅ **Secure Login** – Students log in using their **roll numbers** (pre-existing in the database, no self-registration).  
✅ **Real-Time Course Registration** – Instantly updates seat availability without refreshing the page.  
✅ **Interactive Weekly Schedule** – A **visual timetable** dynamically updates as students register for or drop courses.  
✅ **Conflict Detection** – Automatically highlights **overlapping class timings** to prevent scheduling errors.  
✅ **Prerequisite Tracking** – Notifies students if they are missing prerequisites before enrolling in a course.  
✅ **Advanced Course Filtering** – Search for courses by **department, time slots, availability, and prerequisites**.  
✅ **Seat Availability Notification (Bonus)** – Students can subscribe to get notified when a seat becomes available.

**🔹 For Admins**

✅ **Admin Dashboard** – Centralized control panel for course and student enrollment management.  
✅ **Course Management** – Admins can **add, update, delete, and set prerequisites** for courses.  
✅ **Student Enrollment Control** – Admins can manually **enroll students, drop students from courses**, and review their schedules.  
✅ **Seat Management** – Modify seat availability directly from the admin panel.  
✅ **Comprehensive Reports** – Generate reports on:

* Students enrolled in a specific course.
* Courses with available seats.
* Students missing prerequisites.

**🛠️ Tech Stack & Architecture**

**📌 Frontend**

🔹 **HTML, CSS, JavaScript** – For building an interactive and responsive user interface.  
🔹 **EJS (Embedded JavaScript)** – Used instead of plain HTML for dynamic content rendering.

**📌 Backend**

🔹 **Node.js with Express.js** – Manages server-side logic, authentication, and API endpoints.  
🔹 **MongoDB** – NoSQL database to store user accounts, courses, schedules, and seat availability.

**📌 System Architecture**

🔹 **Model-View-Controller (MVC) Pattern** – Ensures modularity and scalability.  
🔹 **Single-Page Application (SPA) Prototype** – Provides a smooth and dynamic user experience.

**📌 Workflow & Implementation**

1️⃣ **Student Login & Authentication**

* Students log in using their **roll numbers** (stored in the database).
* Sessions are maintained for a seamless experience.

2️⃣ **Course Registration & Real-Time Schedule Update**

* Students browse and **select courses** based on availability and prerequisites.
* The **schedule grid updates dynamically** to reflect registered courses.
* Any **overlapping time slots** are highlighted to prevent conflicts.

3️⃣ **Admin Management Panel**

* Admins add, update, and delete courses.
* Admins manually **register students** and track enrollment.
* Reports and analytics provide insights into registration trends.

4️⃣ **Data Storage & Optimization**

* **Courses, students, and schedules** are efficiently stored in **MongoDB**.
* Indexing ensures **fast query performance** for seat availability and schedules.

**🔹 Future Enhancements & Additional Features**

🚀 **Automated Waitlisting** – If a course is full, students can **join a waitlist** and be auto-enrolled when a seat opens.  
🚀 **AI-Powered Course Recommendations** – Suggests courses based on previous selections and prerequisite fulfillment.  
🚀 **Email & SMS Notifications** – Alerts students about **schedule changes, seat availability, or registration deadlines**.  
🚀 **Mobile App Integration** – Allowing students to register and check schedules via a **mobile-friendly interface**.

**🔹 Conclusion**

The **Course Registration and Scheduling System** provides a **real-world solution** to outdated university registration processes. By **eliminating manual scheduling conflicts, reducing server load from unnecessary refreshes, and optimizing course selection**, this system enhances the **student experience and administrative efficiency**.

With its **scalable architecture**, future upgrades can further improve functionality, making it an **indispensable tool** for educational institutions.