Exploratory Project

Class Timetable Generator

A Full-Stack Solution for Efficient Lecture Planning

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Objective

- Automate Class Scheduling: Develop a web-based tool to streamline timetable creation, eliminating manual effort with a custom Python algorithm.
- Support Flexible Scheduling Options: Enable "All Together" (consecutive hours) and "Distributed Across Days" (random 1 or 2-hour blocks) modes for tailored schedules.
- Integrate Excel Input: Allow educators to upload subject, teacher, and venue constraints via Excel for efficient scheduling.
- **Provide an Intuitive Interface:** Offer a user-friendly web interface for uploading data, selecting scheduling preferences, and viewing multiple generated timetables.

Project Overview

- **Automation:** Automates class scheduling with a Python algorithm, reducing manual effort and ensuring conflict-free timetables.
- **Excel Processing:** Handles Excel inputs (e.g., timetable_data.xlsx) to schedule classes, respecting teacher/venue availability and fixed slots (e.g., HL 9-11).
- Multiple Timetable Generation: Produces two distinct timetables per run, allowing users to choose the best fit.
- Full-Stack Tech: Combines a React frontend for interactive display and a Django backend with Python for scheduling logic, using pandas for Excel processing.
- User-Friendly Design: Features a clear interface with a subject selection form, timetable table, and dropdown to switch between generated timetables.



Key Features

- **Dual Scheduling Modes:** Supports "All Together" for consecutive hours (e.g., MATH 8-12) and "Distributed Across Days" with random 1 or 2-hour blocks (e.g., HL 10-11, 14-16).
- Multiple Timetable Generation: Creates two timetable options per run, accessible via a dropdown for user selection.
- Excel-Driven Constraints: Processes timetable_data.xlsx to manage subjects, teacher availability, and fixed lectures (e.g., HL 9-11).
- Interactive Timetable Display: Features a table with time slots (8:00-18:00) across Monday to Friday, showing subject and venue details.
- User-Centric Design: Simplifies scheduling with a form for subject selection and a clear, navigable timetable output.

How It Works

• Upload Files:

- timetable_data.xlsx: Includes CS constraints like Subjects (e.g., MATH BOB), Fixed Lectures (e.g., HL 9-11 Monday), and Teacher Availability.
- **Generate Timetable:** Backend uses a custom Python algorithm (generate_timetable.py) to create two conflict-free timetables with "All Together" and "Distributed Across Days" modes.
- **Display:** Presents timetables in a table format (8:00-18:00, Monday-Friday), with a dropdown to switch between the two generated options.



Technical Architecture

- **Frontend:** React with components for UI rendering, axios for API calls, and js-cookie for CSRF token management.
- **Backend:** Django handles file uploads and API endpoints, with pandas parsing Excel data and a custom Python script (generate_timetable.py) for scheduling.
- Data Flow: Files → Django views.py → generate_timetable.py (scheduling logic) → JSON response → React UI.
- **Key Libraries:** pandas and openpyxl for Excel processing, with Python's logging for debugging.



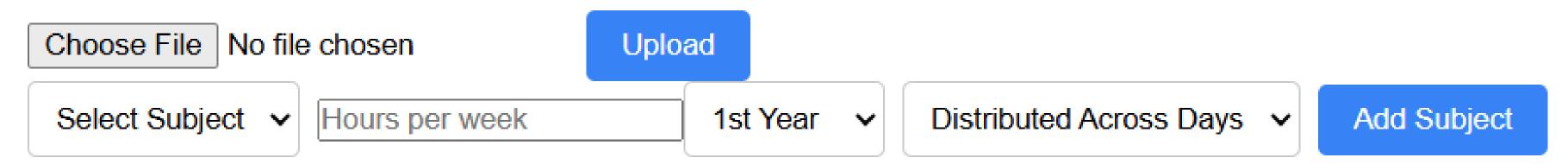
Project Specialities

- Custom Scheduling Logic: Uses a Python algorithm to ensure conflict-free schedules with "All Together" and "Distributed Across Days" options.
- **Multiple Timetable Outputs:** Generates two timetable options per run, enhancing flexibility for educators to select the best schedule.
- Seamless Excel Integration: Processes Excel data to enforce constraints like teacher availability and fixed lectures effortlessly.
- Intuitive User Interface: Combines a React frontend with a table display and dropdown navigation for a smooth user experience.



Demo Snapshots

Timetable Generator



Selected Subjects

Generate Timetables



Demo Snapshots (Input)

Subjects

4	Α	В	С	D	
1	Subject	Teacher	Year	Hours	
2	MATH	BOB	1st Year	3	
3	PHYSICS	ALICE	1st Year	4	
4	CHEMISTR	CAROL	1st Year	2	
5	BIOLOGY	DAVE	1st Year	2	
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Venues

1	Α
1	Venue
2	LT-1.11
3	LT-2

Fixed Lectures

	Α	В	С	D	Е	F	G
1	Subject	Teacher	Year	Day	Start Hour	End Hour	Venue
2	HL	CAROL	1st Year	Monday	9	11	LT-1.11
3	OE	BOB	1st Year	Tuesday	13	15	LT-2

Teacher Availability

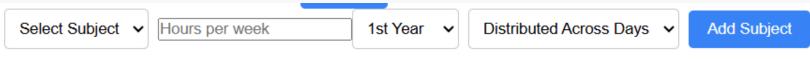
	Α	В	С	D	Е	F
1	Teacher	Monday	Tuesday	Wednesday	Thursday	Friday
2	ALICE	10-12,15-18	10-12,15-18	10-12,15-18	10-12,15-18	10-12,15-18
3	ВОВ	8-11,13-16	8-11,13-16	8-11,13-16	8-11,13-16	8-11,13-16
4	CAROL	9-11,13-18	9-11,13-18	9-11,13-18	9-11,13-18	9-11,13-18
5	DAVE	11-12,14-18	11-12,14-18	11-12,14-18	11-12,14-18	11-12,14-18

Venue Availability

	Α	В	С	D	Е	F
1	Venue	Monday	Tuesday	Wednesda	Thursday	Friday
2	LT-1.11	8-12,13-18	8-12,13-18	8-12,13-18	8-12,13-18	8-12,13-18
3	LT-2	8-12,13-18	8-12,13-18	8-12,13-18	8-12,13-18	8-12,13-18



Output



Selected Subjects

- MATH BOB 4 hours 1st Year all_together
- PHYSICS ALICE 3 hours 1st Year distributed
- CHEMISTRY CAROL 4 hours 1st Year distributed
- BIOLOGY DAVE 2 hours 1st Year distributed

Generate Timetables

Generated Timetables

Timetable 1

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8-9					
9-10	HL, LT-1.11		CHEMISTRY, LT-2		
10-11	HL, LT-1.11		CHEMISTRY, LT-2	PHYSICS, LT-2	
11-12		BIOLOGY, LT-2		PHYSICS, LT-2	
12-13					
13-14		OE, LT-2			
14-15	CHEMISTRY, LT-2	OE, LT-2			
15-16	CHEMISTRY, LT-2				
16-17	BIOLOGY, LT-2				
17-18					PHYSICS, LT-2

The End