

Software Documentation: Classroom Planner Web Application

Title Page

Project Name: Classroom Planner Web Application

Version: 1.0.0

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Abstract

The Classroom Planner application is a web-based platform for managing multiple academic sessions, enabling administrators to efficiently allocate classrooms, schedule courses, and assign instructors and students without conflicts. It ensures operational efficiency, robust timetable management, and an interactive scheduling interface for academic institutions.

Introduction

Purpose: This document outlines the complete technical and functional details for the Classroom Planner, covering its requirements, system design, architecture, risk assessment, cost estimation, and software metrics.

Audience: Developers, testers, project managers, and university administrators.

Product Scope: Streamline the scheduling of academic sessions with dynamic, conflict-free timetable generation and resource management.

System Overview

The Classroom Planner web application provides:

- Session creation with classroom, instructor, student, and course management.
- Timetable slot management.
- Conflict detection (student, instructor, and classroom overlaps).
- Drag-and-drop timetable builder with live conflict feedback.
- JSON-based session data import/export.

Architecture:

- **Frontend:** HTML, CSS, vanilla JavaScript.
 - **Backend:** Node.js with modular classes for core entities.
 - **Server:** Express.js serving static files.
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UML Diagrams

Structural and Behavioral Diagrams: Refer to `structure_diagram.png` and `behavior_diagram.png` for detailed system structure and workflows.

Entities: Session, Program, Department, Course, Student, Instructor, Classroom, Slot.

Key Relationships:

- One-to-many between Session and Programs.
 - Programs contain multiple Departments.
 - Departments manage Courses, Classrooms, Instructors, Students.
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Functional Requirements

FR-1: Define and manage time slots. **FR-2:** Import session data via JSON. **FR-3:** Detect scheduling conflicts between students and instructors. **FR-4:** Assign classrooms based on capacity and availability. **FR-5:** Visualize timetable via drag-and-drop interface. **FR-6:** Export final timetable as JSON.



Non-functional Requirements

NFR-1: Web-based, cross-platform compatibility. **NFR-2:** Support at least 1000 concurrent users. **NFR-3:** Secure login (future scope: JWT-based authentication). **NFR-4:** Response time for scheduling changes under 2 seconds.



Risk Assessment Summary

Risk	Likelihood	Impact	Mitigation
Invalid JSON data	4	5	Schema validation & error messages
Slot conflict detection failure	3	5	Backend conflict checks with full test coverage
Classroom overbooking	3	5	Validate by capacity before assignment
UI drag-drop errors	3	4	Feedback highlights & fallback controls
Performance with large data	2	4	Optimize rendering and event throttling

(Full matrix in `ClassroomPlanner_RiskAssessment.pdf`)



COCOMO Estimation

Mode: Organic

Effort Adjustment Factor (EAF): 0.36

Component	Effort (PM)
Unit Level	15.20
System Level	4.90
Total	7.24

Schedule: 4 months

Team Size: 6 developers

(Reference: COCOMO_MODEL.pdf)



Cyclomatic Complexity

- **Unit Level (addCourseToSlot):** 5
- **System Level:** 4

As computed using standard flow graph metrics. (See CYCLOMATIC_SE_5.pdf)



Conclusion & Future Enhancements

The Classroom Planner fulfills its primary goals: conflict-free scheduling, session management, and a visual timetable builder. The system is robust, modular, and scalable.

Planned Features:

- AI-powered schedule optimization.
 - Mobile app interface.
 - API integrations with university systems.
 - JWT-based secure multi-role access control.
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