Timetable Generator Web Application Documentation

1. Introduction

- **Project Overview**:
  The **Timetable Generator Web Application** is a custom-built tool designed to automate the creation and management of course schedules for educational institutions. The application simplifies the process of generating accurate, conflict-free timetables by allowing instructors to input course details, durations, and availability. It integrates dynamic dropdowns for selecting course types, terms, and term durations, all of which are fetched from a MongoDB database.
  The application ensures data integrity and validation, with dropdowns that prevent invalid selections and forms that validate inputs before submission. The app is designed with Mid-State branding to align with the institution's identity.
  Key features include external Google authentication for secure login, seamless CRUD operations for managing course-related data, and a user-friendly interface that enhances the overall experience for school instructors.
- **Target Audience**:
  The primary users of this application are **school instructors** and **administrative staff** who manage academic course scheduling. It is also useful for program coordinators who need to oversee multiple course schedules across different departments.
- **Technologies Used**:
  - Blazor (for UI and front-end components)
  - ASP.NET Core (for back-end functionality)
  - MongoDB (for data storage and management)
  - xUnit (for unit testing)
  - Google external login (for secure user authentication)
  - Mid-State branding for styling and UI consistency

2. System Requirements

- **Browser Compatibility**: Modern web browsers such as Google Chrome, Microsoft Edge, Firefox, or Safari.
- **Device Compatibility**: Desktop or laptop with a stable internet connection for optimal performance.
- **Minimum Screen Resolution**: 1280x720 or higher for a user-friendly experience.
- **Authentication**: Google account for login, or manual account creation.

3. User Interface Overview

- **Login & Authentication**:
  Users have two options for logging in or registering with the application: they can either use traditional username and password registration or take advantage of Google external authentication. The Google authentication allows users to register and log in quickly, streamlining the process for those with Google accounts.
- **Navigation**:
  The application features a sidebar navigation layout with helpful icons, providing users with an intuitive and organized interface. The sidebar allows for easy access to various sections of the application, enabling users to navigate without cluttering the main workspace.
- **Dashboard**:
  The dashboard serves as the central hub for users. For **admin users**, it provides access to administrative tools, including course management and user settings. **Regular users** can see a list of their courses, with convenient links to add or edit them, as well as manage task types. Users also have access to a list of timetables they've already created, making it easy to track and review past schedules.
- **Timetable Generator**:
  The timetable generator page allows users to create timetables for their courses. This page uses a **draggable interface**, which enhances the user experience by making it simple to adjust and organize timetables with drag-and-drop functionality.

4. Functionality & Features

- **Core Features**:
  Admin Features:
    - **Error & Activity Logs**: Admins can view error and activity logs to monitor system performance and user activities.
    - **Help Page Management**: An editable help page allows admins to provide and update user guidance and troubleshooting information.
    - **User Management**: Admins have the ability to manage users, including promoting any user to an admin role.

    - **Term & Term Duration Management**: Admins can create and edit terms and term durations for scheduling purposes.
    - **Course Modality Management**: Admins can manage and define course modalities (e.g., Online, In-Person, Hybrid), ensuring flexibility in course setup.
- **Regular User Features**:
    - **Course Management**: Regular users can add their courses to the system, associating them with terms and modalities.
    - **Task Management**: Users can create tasks for each course, with the ability to assign task types such as reading assignments or extra credit.
    - **Task Type Creation**: Users can create a personalized list of task types, enhancing the organization and categorization of tasks.
    - **Timetable Generation**: Users can generate timetables for their courses. The generated timetables can be:
        - Printed
        - Exported as a PDF
        - Exported as an Excel document
        - Viewed in a weekly format and exported in any of the above formats
- **Data Input & Validation**:
  All forms in the application enforce strict validation based on the underlying data models. Validation includes:
    - Minimum and maximum length enforcement for input fields.
    - Data type checks to ensure accuracy (e.g., dates, numbers).
    - Validation messages appear when fields are blurred, providing immediate feedback to the user.
- **CRUD Operations**:
  CRUD (Create, Read, Update, Delete) operations are available for managing:
    - Courses and associated details.
    - Tasks and task types.
    - Terms, term durations, and course modalities (admin-only features).
    - Users (admin-only feature for user management).

5. Testing & Quality Assurance

- **Testing Strategy**:
  The project employs **xUnit** for unit testing to ensure that individual components of the application function as intended. The focus is on validating the correctness of critical functionalities within the Timetable Generator application. A comprehensive test document will be created soon to outline the full testing strategy, including any planned testing methodologies and practices.
- **Key Test Cases**:
  Important functionalities being tested include:
    - **Course Creation**: Ensuring that users can successfully add new courses and that all required fields are validated correctly.

- **Timetable Generation**: Verifying that the timetable generation logic correctly handles course schedules, prevents conflicts, and allows for the draggable interface functionality.

6. Deployment & Hosting

The **Timetable Generator Web Application** is hosted on the Azure cloud platform, providing a reliable, scalable, and secure environment to support its functionality and user experience.

7. Conclusion

The **Timetable Generator Web Application** serves as a robust solution for educators and administrative staff, streamlining the process of course scheduling and management. By integrating user-friendly features, such as a draggable timetable generator and comprehensive user management capabilities, the application enhances operational efficiency and supports effective academic planning.

The use of xUnit for testing ensures the reliability and functionality of the application, while Google authentication provides a secure and straightforward user experience. As the project continues to evolve, it aims to incorporate additional features and enhancements based on user feedback, further solidifying its value in academic environments.