UNICOM TIC

PROJECT REPORT

Introduction

My name is Nixon Yapes , and this report summarizes the design and development of the *Unicom TIC Management System* desktop application. Developed as part of my academic coursework, the project offered a valuable opportunity to apply object-oriented programming principles, implement graphical user interfaces using C# WinForms, and explore modular application architecture through the MVC design pattern. This report outlines the system’s key features, technologies used, development challenges, and the lessons gained during the process.

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Problem Definition

Educational institutions often rely on fragmented systems to manage academic operations like course registration, examinations, and scheduling. The *Unicom TIC Management System* addresses this gap by providing a unified desktop application that simplifies academic administration. It allows role-based access for Admin, Staff, Lecturers, and Students to manage essential modules like students, courses, exams, and timetables.

Project Requirements

Functional Requirements

- Role-based login (Admin, Staff, Lecturer, Student)
- Create, edit, and manage Courses, Subjects, Students, Exams
- View and record student marks
- Allocate classrooms (labs/halls) to timetable entries
- Role-specific dashboards displaying permitted features

Non-Functional Requirements

- Clean and intuitive UI using C# WinForms
- Persistent data storage using SQLite
- Scalable, modular MVC-based architecture
- Input validation and error message handling

Focus on quality attributes and tech constraints.

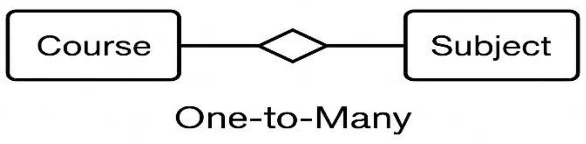
- Simple and intuitive UI using WinForms
- Persistent storage using SQLite
- Scalable and modular structure via MVC
- Error handling and input validation

System Design

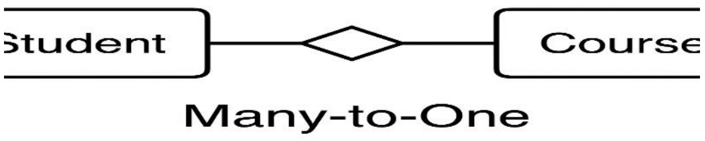
a. Entity-Relationship Diagram

The data model is structured with the following key relationships:

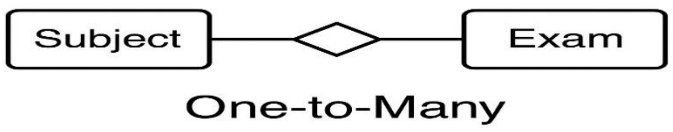
- One Course has many Subjects



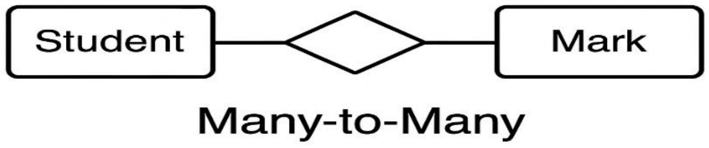
- Many Students belong to one Course



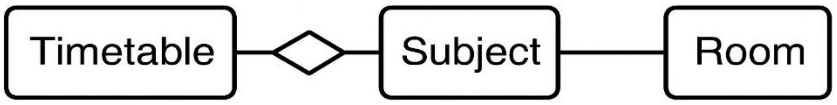
- One Subject has multiple Exams



- One Student has many Marks (linked via Exams)



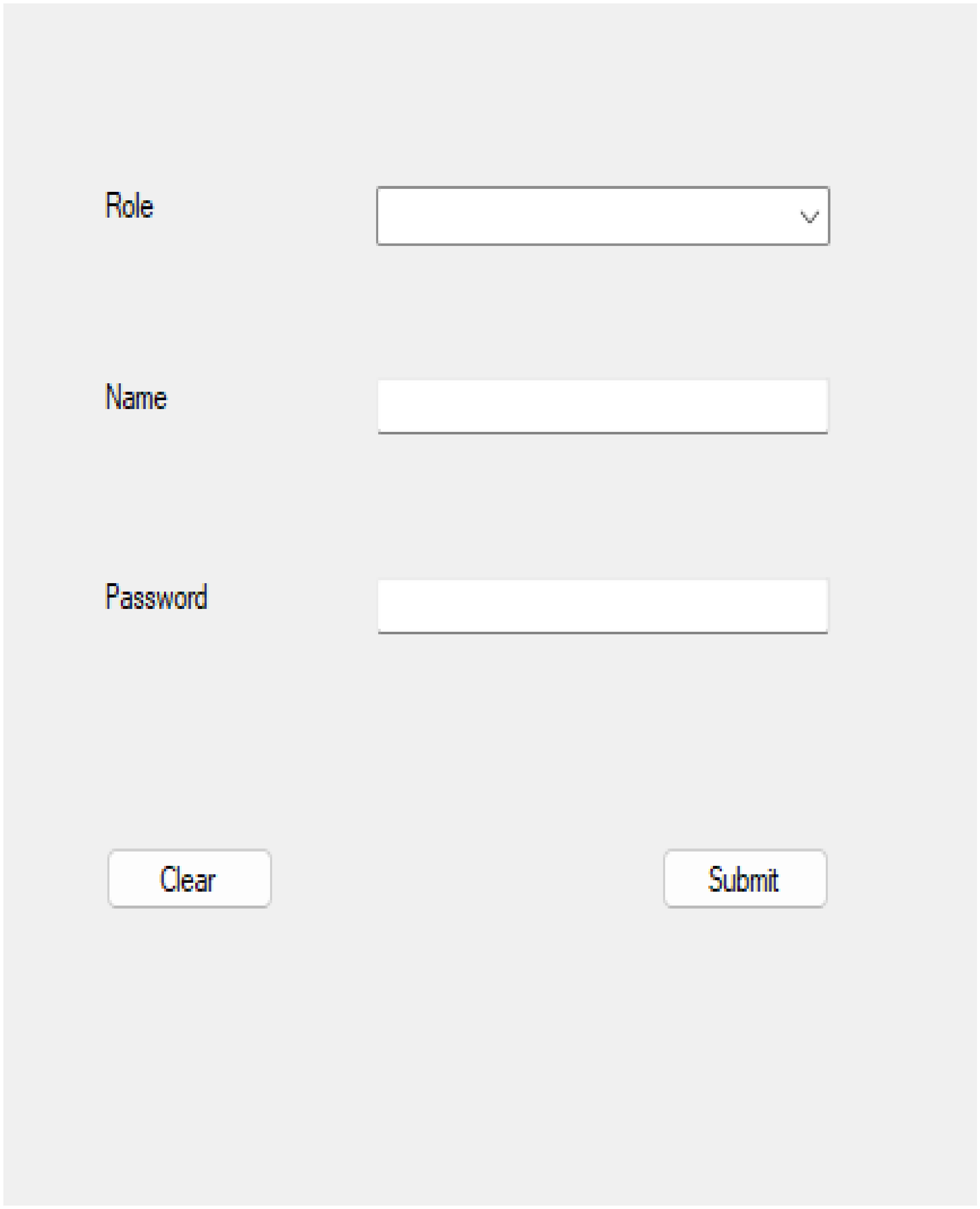
- Each Timetable entry links one Subject to one Room (Lab or Hall)

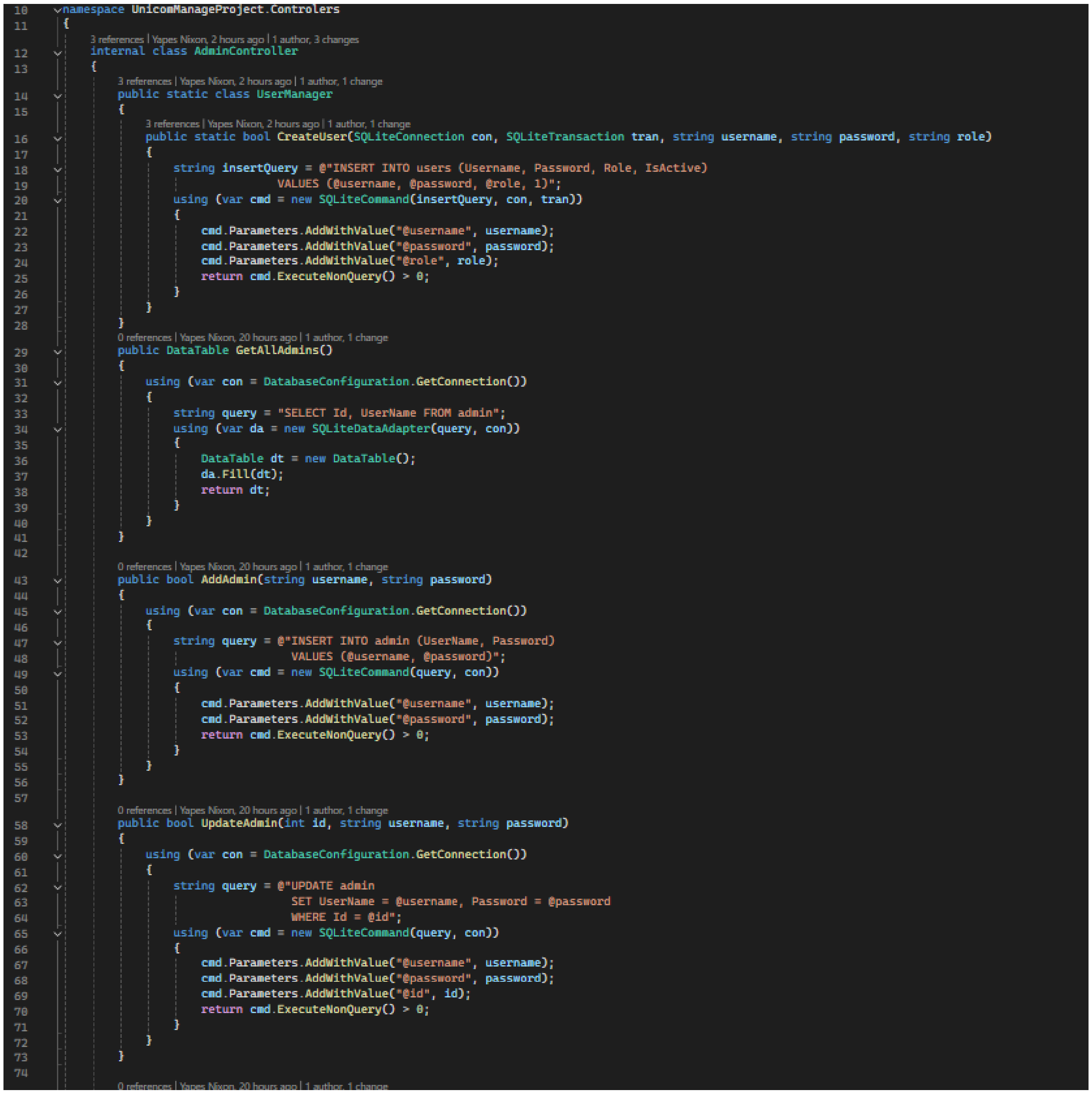


Wireframes

Include UI sketches or screenshots of:

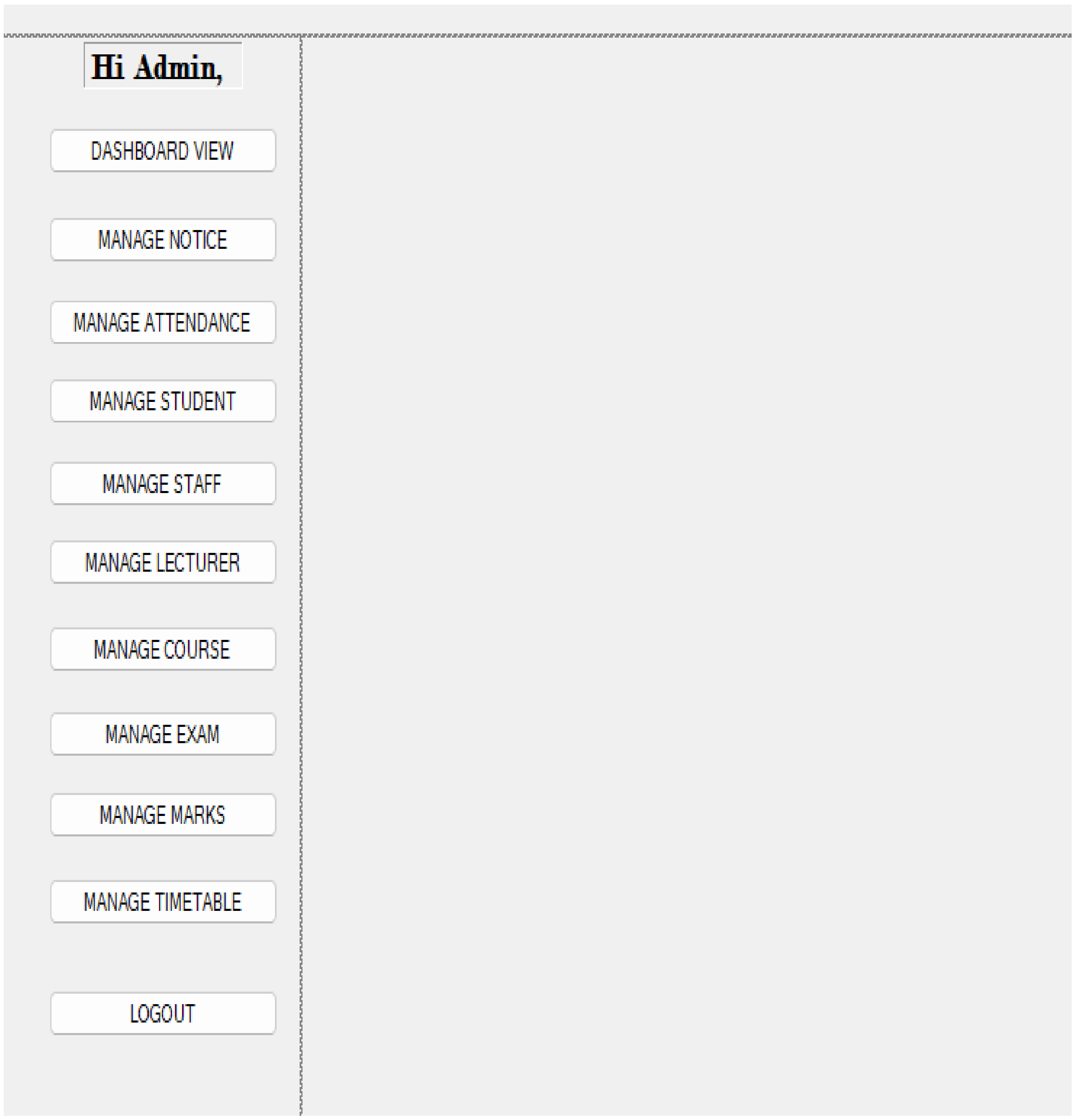
- Login Form



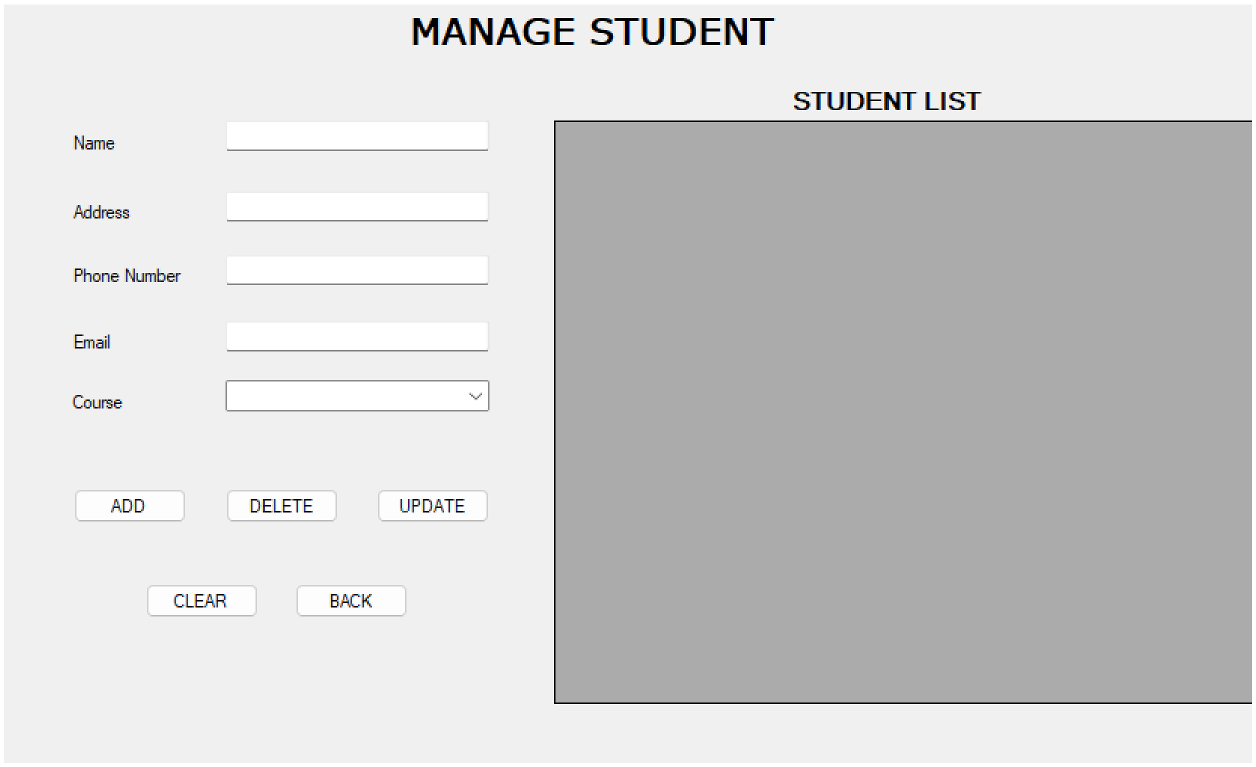


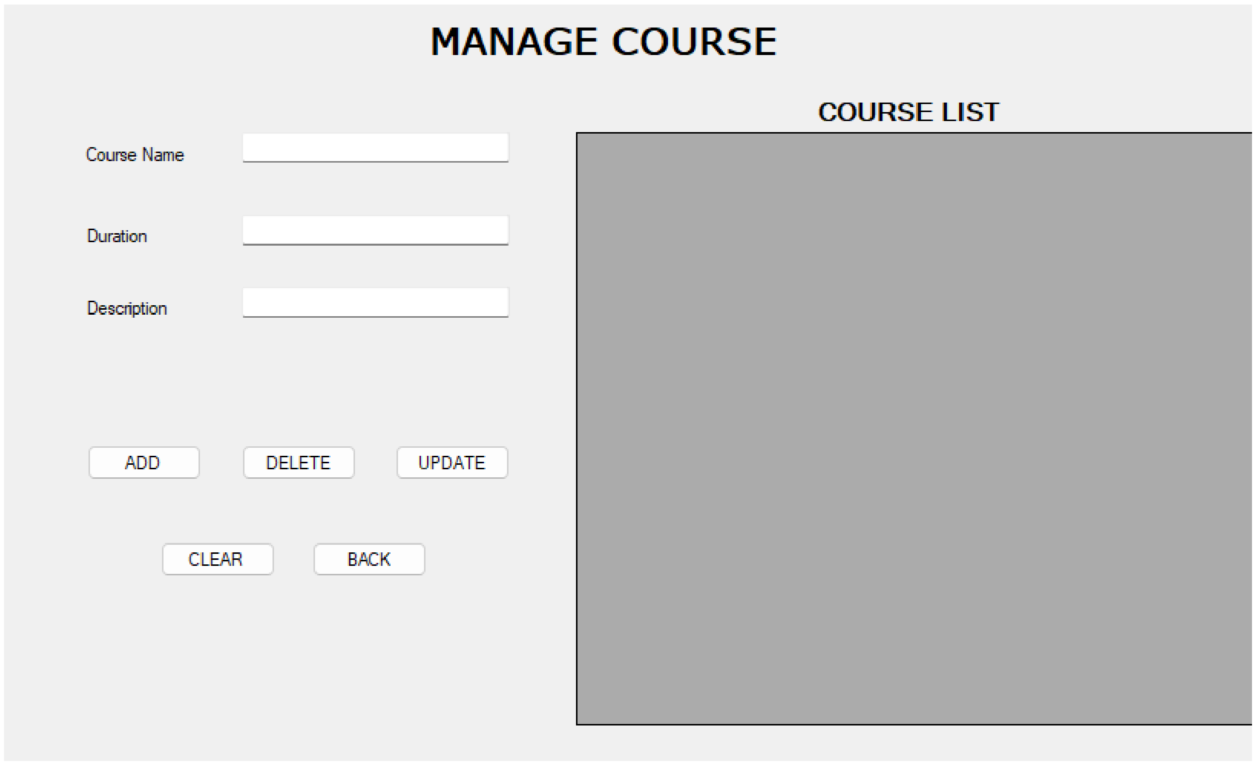
```
namespace UnicomManageProject.Controlers
{
    3 references | Yapes Nixon, 2 hours ago | 1 author, 3 changes
    internal class AdminController
    {
        3 references | Yapes Nixon, 2 hours ago | 1 author, 1 change
        public static class UserManager
        {
            3 references | Yapes Nixon, 2 hours ago | 1 author, 1 change
            public static bool CreateUser(SQLiteConnection con, SQLiteTransaction tran, string username, string password, string role)
            {
                string insertQuery = @"INSERT INTO users (Username, Password, Role, IsActive)
                               VALUES (@username, @password, @role, 1)";
                using (var cmd = new SQLiteCommand(insertQuery, con, tran))
                {
                    cmd.Parameters.AddWithValue("@username", username);
                    cmd.Parameters.AddWithValue("@password", password);
                    cmd.Parameters.AddWithValue("@role", role);
                    return cmd.ExecuteNonQuery() > 0;
                }
            }
        }
        0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
        public DataTable GetAllAdmins()
        {
            using (var con = DatabaseConfiguration.GetConnection())
            {
                string query = "SELECT Id, UserName FROM admin";
                using (var da = new SQLiteDataAdapter(query, con))
                {
                    DataTable dt = new DataTable();
                    da.Fill(dt);
                    return dt;
                }
            }
        }

        0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
        public bool AddAdmin(string username, string password)
        {
            using (var con = DatabaseConfiguration.GetConnection())
            {
                string query = @"INSERT INTO admin (UserName, Password)
                                 VALUES (@username, @password)";
                using (var cmd = new SQLiteCommand(query, con))
                {
                    cmd.Parameters.AddWithValue("@username", username);
                    cmd.Parameters.AddWithValue("@password", password);
                    return cmd.ExecuteNonQuery() > 0;
                }
            }
        }

        0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
        public bool UpdateAdmin(int id, string username, string password)
        {
            using (var con = DatabaseConfiguration.GetConnection())
            {
                string query = @"UPDATE admin
                                 SET UserName = @username, Password = @password
                                 WHERE Id = @id";
                using (var cmd = new SQLiteCommand(query, con))
                {
                    cmd.Parameters.AddWithValue("@username", username);
                    cmd.Parameters.AddWithValue("@password", password);
                    cmd.Parameters.AddWithValue("@id", id);
                    return cmd.ExecuteNonQuery() > 0;
                }
            }
        }

        0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
```

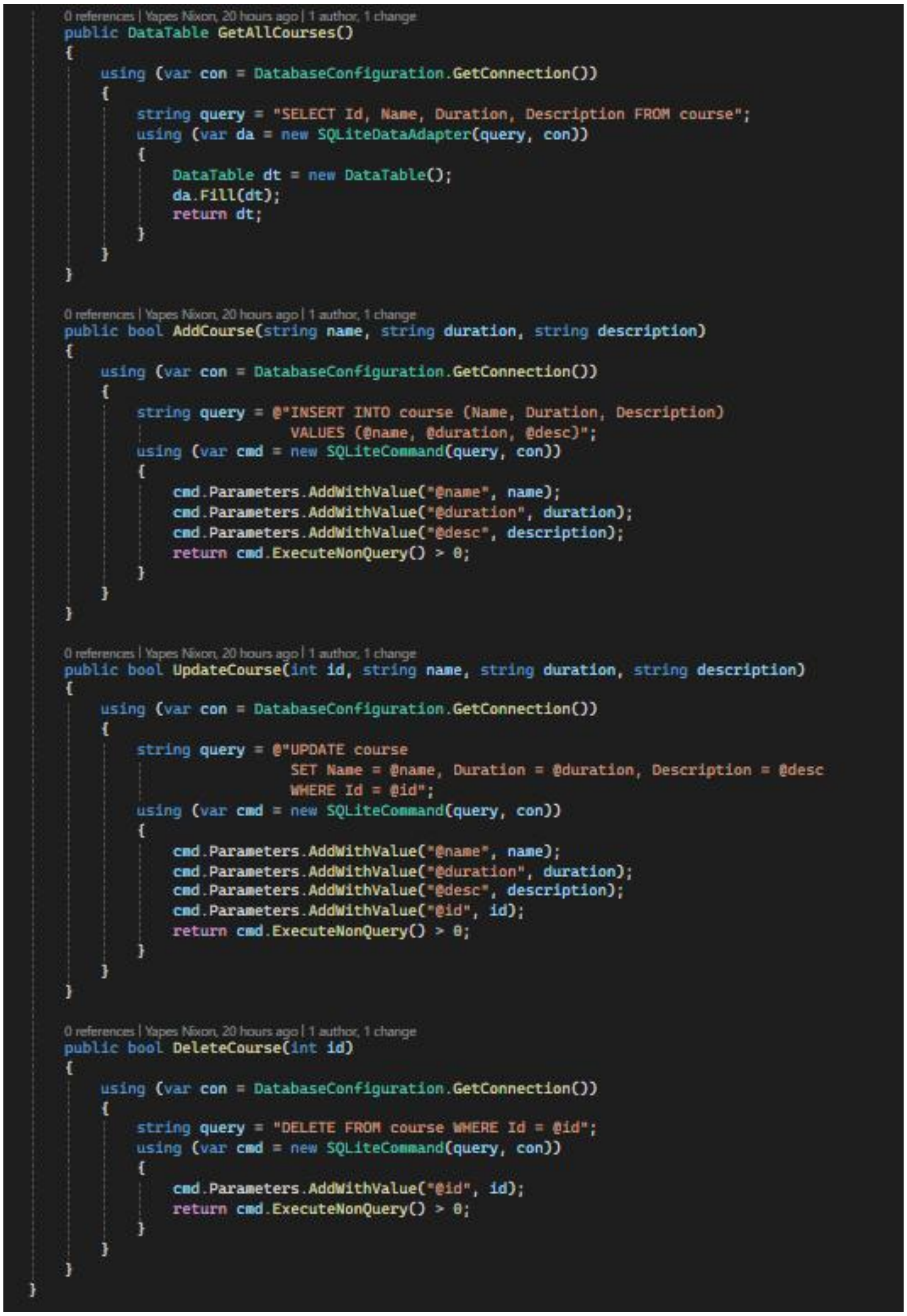
- Main Dashboard Form



- CourseForm / StudentForm

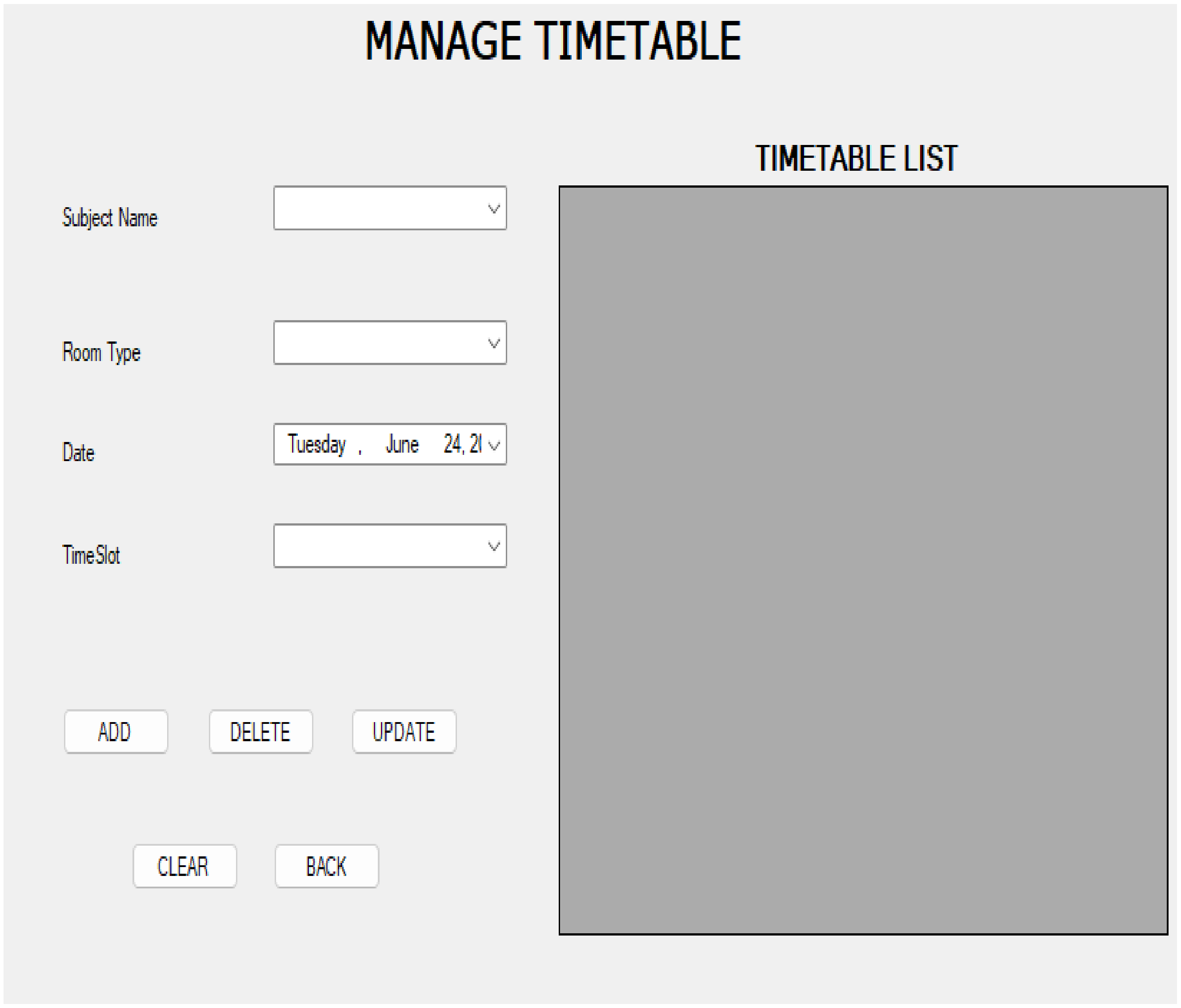


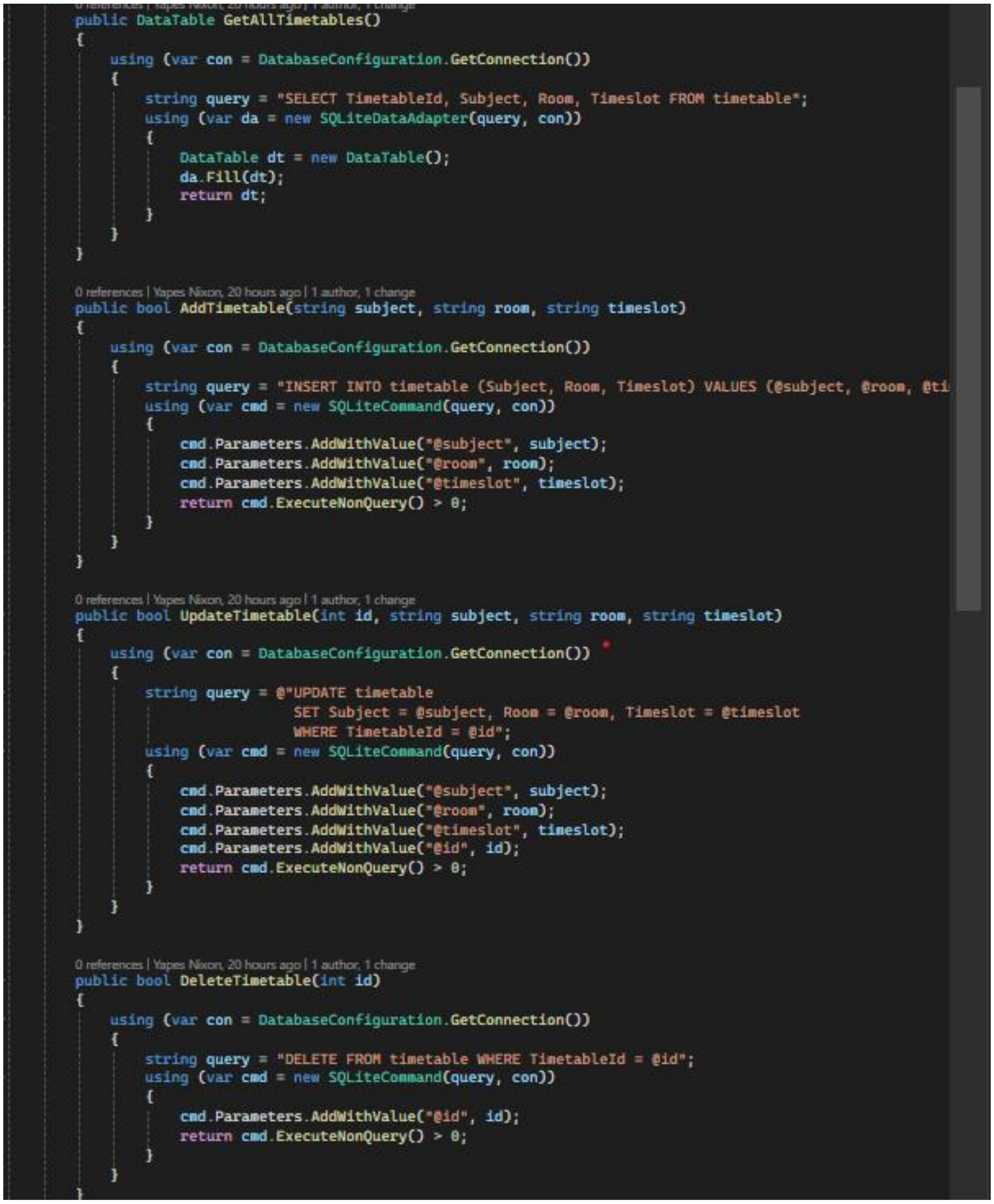




```
    0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
    public DataTable GetAllCourses()
    {
        using (var con = DatabaseConfiguration.GetConnection())
        {
            string query = "SELECT Id, Name, Duration, Description FROM course";
            using (var da = new SQLiteDataAdapter(query, con))
            {
                DataTable dt = new DataTable();
                da.Fill(dt);
                return dt;
            }
        }
    }

    0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
    public bool AddCourse(string name, string duration, string description)
    {
        using (var con = DatabaseConfiguration.GetConnection())
        {
            string query = @"INSERT INTO course (Name, Duration, Description)
                             VALUES (@name, @duration, @desc)";
            using (var cmd = new SQLiteCommand(query, con))
            {
                cmd.Parameters.AddWithValue("@name", name);
                cmd.Parameters.AddWithValue("@duration", duration);
                cmd.Parameters.AddWithValue("@desc", description);
                return cmd.ExecuteNonQuery() > 0;
            }
        }
    }

    0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
    public bool UpdateCourse(int id, string name, string duration, string description)
    {
        using (var con = DatabaseConfiguration.GetConnection())
        {
            string query = @"UPDATE course
                             SET Name = @name, Duration = @duration, Description = @desc
                             WHERE Id = @id";
            using (var cmd = new SQLiteCommand(query, con))
            {
                cmd.Parameters.AddWithValue("@name", name);
                cmd.Parameters.AddWithValue("@duration", duration);
                cmd.Parameters.AddWithValue("@desc", description);
                cmd.Parameters.AddWithValue("@id", id);
                return cmd.ExecuteNonQuery() > 0;
            }
        }
    }

    0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
    public bool DeleteCourse(int id)
    {
        using (var con = DatabaseConfiguration.GetConnection())
        {
            string query = "DELETE FROM course WHERE Id = @id";
            using (var cmd = new SQLiteCommand(query, con))
            {
                cmd.Parameters.AddWithValue("@id", id);
                return cmd.ExecuteNonQuery() > 0;
            }
        }
    }
}
```

- TimetableForm (with room selection dropdown)





```
0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
public DataTable GetAllTimetables()
{
    using (var con = DatabaseConfiguration.GetConnection())
    {
        string query = "SELECT TimetableId, Subject, Room, Timeslot FROM timetable";
        using (var da = new SQLiteDataAdapter(query, con))
        {
            DataTable dt = new DataTable();
            da.Fill(dt);
            return dt;
        }
    }
}

0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
public bool AddTimetable(string subject, string room, string timeslot)
{
    using (var con = DatabaseConfiguration.GetConnection())
    {
        string query = "INSERT INTO timetable (Subject, Room, Timeslot) VALUES (@subject, @room, @ti
        using (var cmd = new SQLiteCommand(query, con))
        {
            cmd.Parameters.AddWithValue("@subject", subject);
            cmd.Parameters.AddWithValue("@room", room);
            cmd.Parameters.AddWithValue("@timeslot", timeslot);
            return cmd.ExecuteNonQuery() > 0;
        }
    }
}

0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
public bool UpdateTimetable(int id, string subject, string room, string timeslot)
{
    using (var con = DatabaseConfiguration.GetConnection())
    {
        string query = @"UPDATE timetable
                         SET Subject = @subject, Room = @room, Timeslot = @timeslot
                         WHERE TimetableId = @id";
        using (var cmd = new SQLiteCommand(query, con))
        {
            cmd.Parameters.AddWithValue("@subject", subject);
            cmd.Parameters.AddWithValue("@room", room);
            cmd.Parameters.AddWithValue("@timeslot", timeslot);
            cmd.Parameters.AddWithValue("@id", id);
            return cmd.ExecuteNonQuery() > 0;
        }
    }
}

0 references | Yapes Nixon, 20 hours ago | 1 author, 1 change
public bool DeleteTimetable(int id)
{
    using (var con = DatabaseConfiguration.GetConnection())
    {
        string query = "DELETE FROM timetable WHERE TimetableId = @id";
        using (var cmd = new SQLiteCommand(query, con))
        {
            cmd.Parameters.AddWithValue("@id", id);
            return cmd.ExecuteNonQuery() > 0;
        }
    }
}
```

Coding

a. Object-Oriented Programming

Inheritance Student, Lecturer, and Admin classes inherit from a base User class to share common properties such as Username, Password, and Role.

Polymorphism Role-based functionality is implemented through polymorphic methods, such as overriding DisplayDashboard() to load features based on the authenticated user's role.

b. MVC Pattern

The application is structured using the Model-View-Controller design pattern:

- **Models** encapsulate business logic and data structures
- **Views** are responsible for user interface components (WinForms)
- **Controllers** coordinate data flow, UI events, and database interaction

This structure promotes separation of concerns, making the system modular, scalable, and easier to test and maintain.

References

- Microsoft Documentation: C# Programming and WinForms
- SQLite Official Documentation
- System.Data.SQLite NuGet package
- Tutorials on MVC implementation in desktop applications

- Stack Overflow community guidance
- Visual Studio Form Designer documentation