

# Software Development Plan

## Gym And Fitness (C# Desktop App)



**Submitted by:**

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Course:  
INTRODUCTION TO SOFTWARE ENGINEERING  
SEN-210  
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Class: BSE 2A  
Assignment # 4  
Date of Submission: June 2, 2025

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# 1. INTRODUCTION

This document outlines a detailed software development plan for “**Gym And Fitness**” C# Desktop Application built using Windows Forms (.NET Framework). The application will help users track workouts, nutrition, and progress. The plan covers requirements analysis, system architecture, development methodology, risk management, testing, and maintenance to ensure a user-friendly, efficient, and scalable fitness application.

## 2. REQUIREMENTS ANALYSIS

### 2.1. Functional Requirements

The system will provide the following core functionalities:

- **Member Management:** Add, update, delete gym member records.
- **BMI Calculator Module:** Users can calculate their Body Mass Index.
- **Personal Profile:** To maintain a proper fitness profile.
- **Workout Module:** Users can access pre-defined workout routines or create their own custom plans.
- **Nutrition Tracking:** A built-in system to search for meals and track calorie intake.
- **Diet Plans (Customizable):** Suggested meal recipes based on fitness goals + customized meal scheduling for breakfast, lunch, dinner, snacks, etc.
- **Water Intake Tracking:** A feature to track daily water intake.
- **Fitness Progress Monitoring:** Users can track their progress through visual analytics and reports.
- **Workout Guides:** Comprehensive workout guides categorized by exercise type.
- **Customized Workout Plans:** Personalized workout plans for structured exercise tracking.
- **Challenges Section & Motivational Quotes:** To keep users motivated throughout their fitness journey.
- **SQL Database Integration:** Secure storage and retrieval of user data, including fitness progress, workouts, and nutrition records.

### 2.2. Non-Functional Requirements

- **Performance:** Load forms under 2 seconds (Memory optimization).
- **User-Friendly Interface:** Designed using Windows Forms (WinForms) for easy navigation and interaction.
- **Reliability:** 99% uptime and safe error handling.
- **Usability:** Simple GUI with clear labels.
- **Security:** Secure login/signup, Password hashing.
- **Maintainability:** Well-commented code, modular design.

### 2.3. Operational Environment

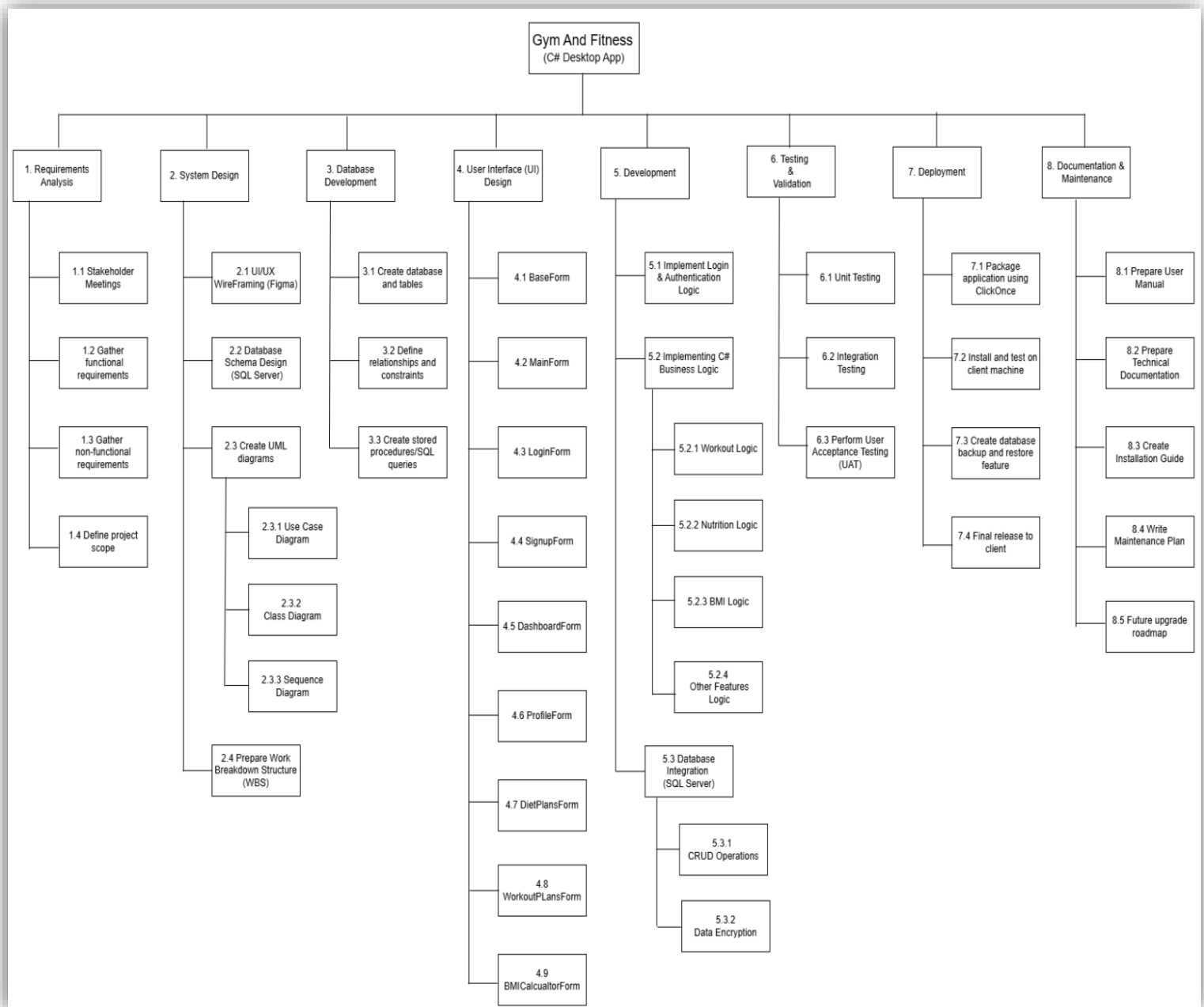
- **Platform:** Windows 10/11
- **Framework:** .NET Framework 4.7.2+
- **Database:** SQL Server LocalDB 2022
- **Users:** Any user (since it's a personal fitness application)

## 3. SYSTEM ARCHITECTURE DESIGN

### 3.1. High-Level Architecture

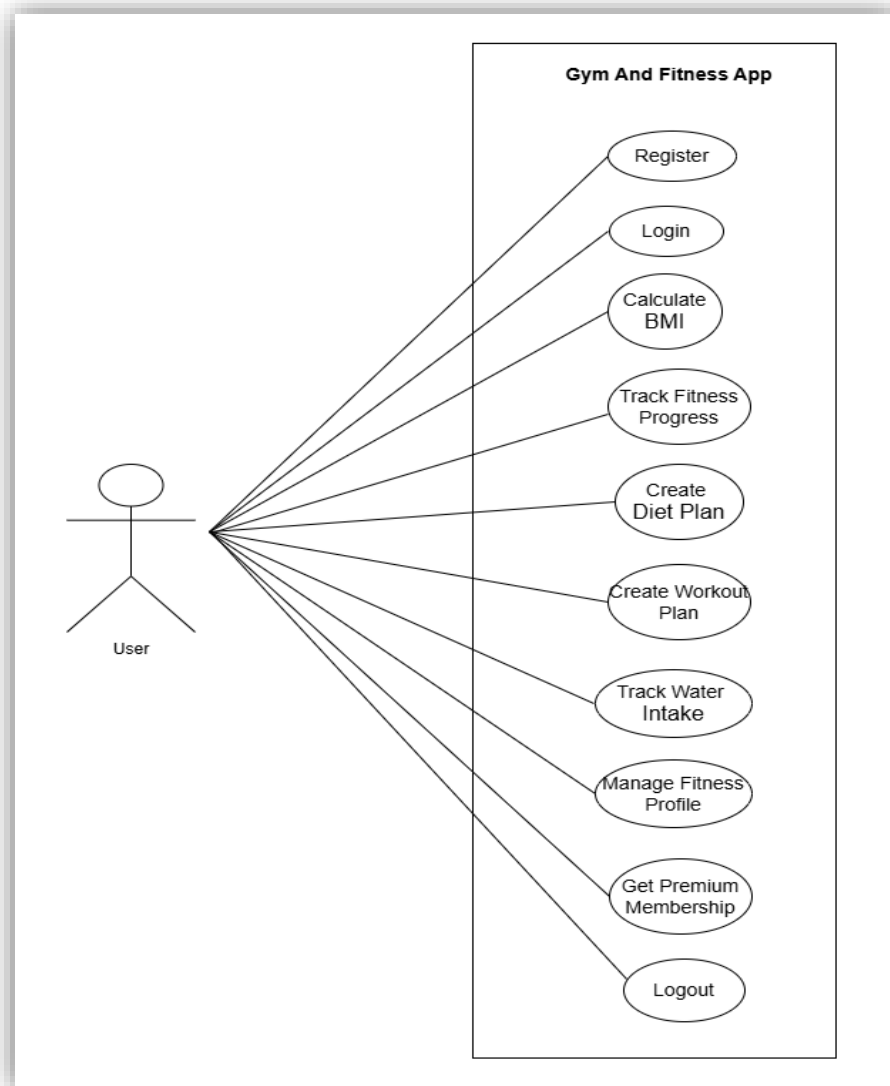
- **Frontend (UI Layer):** GDI+ / WinForms Controls
- **Backend (Business Logic Layer):** C# (.NET Framework)
- **Database (Data Layer):** SQL Server (local storage)

## 3.2. Work Breakdown Structure (WBS)

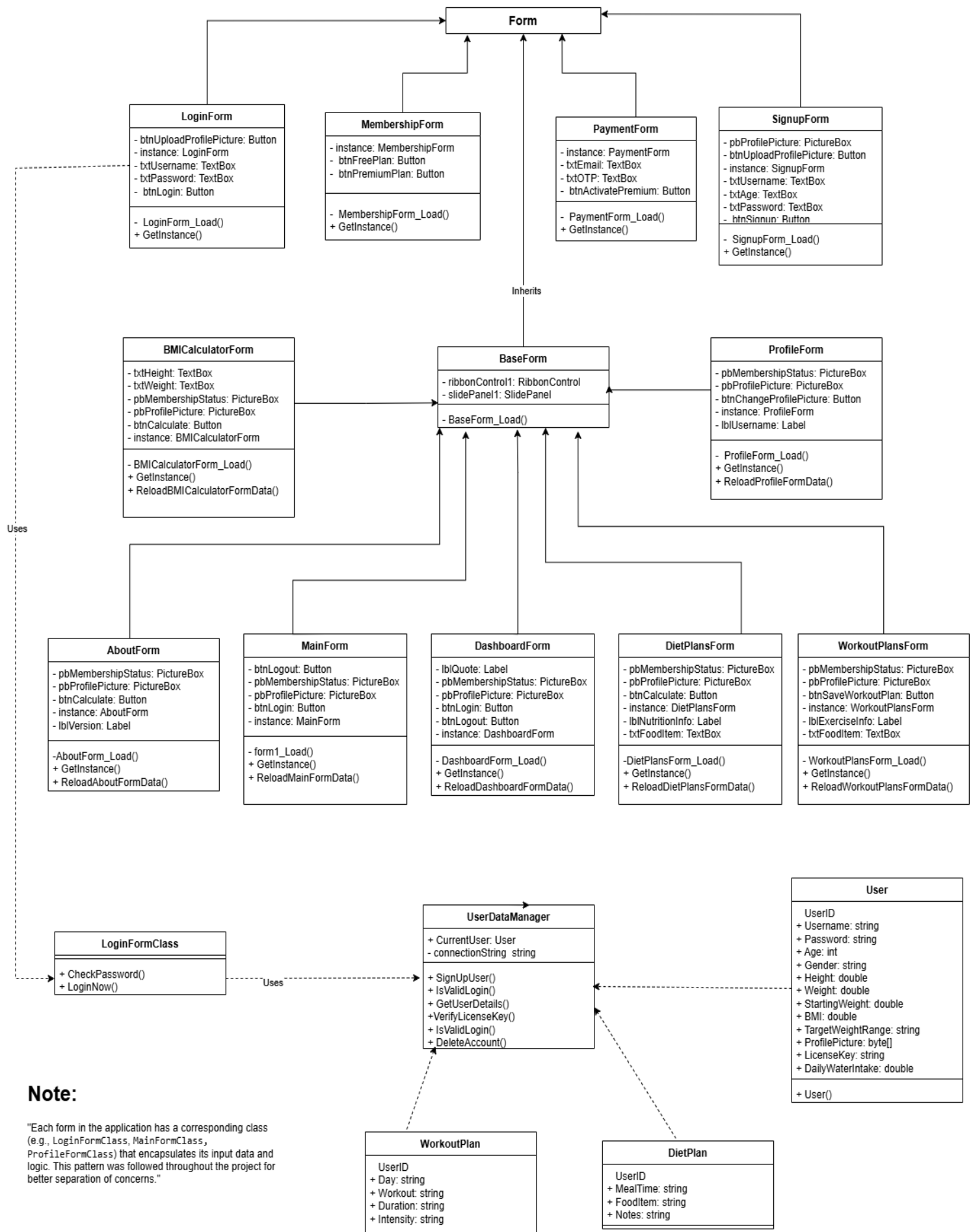


### 3.3. UML DIAGRAMS

#### 3.3.1. Use Case Diagram

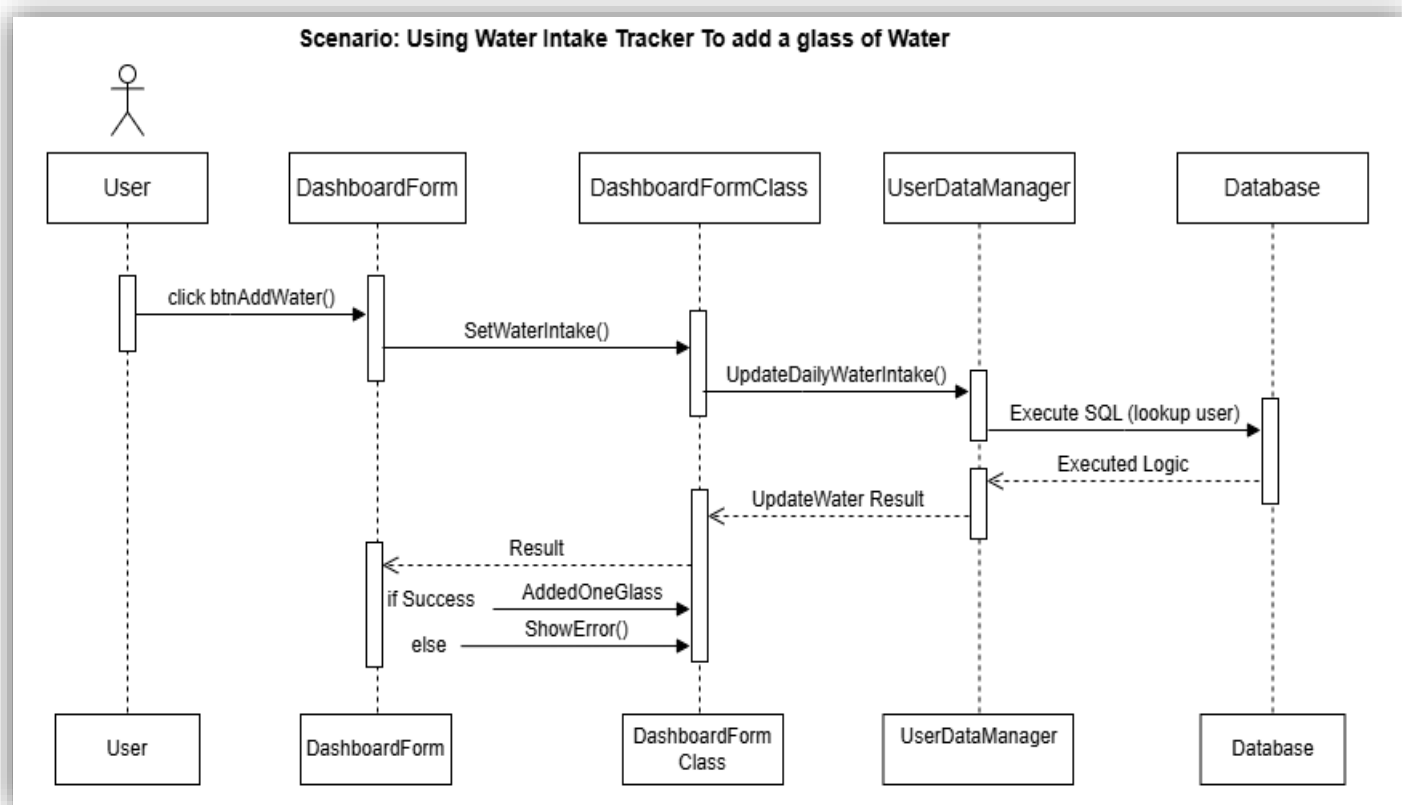


### 3.3.2. Class Diagram

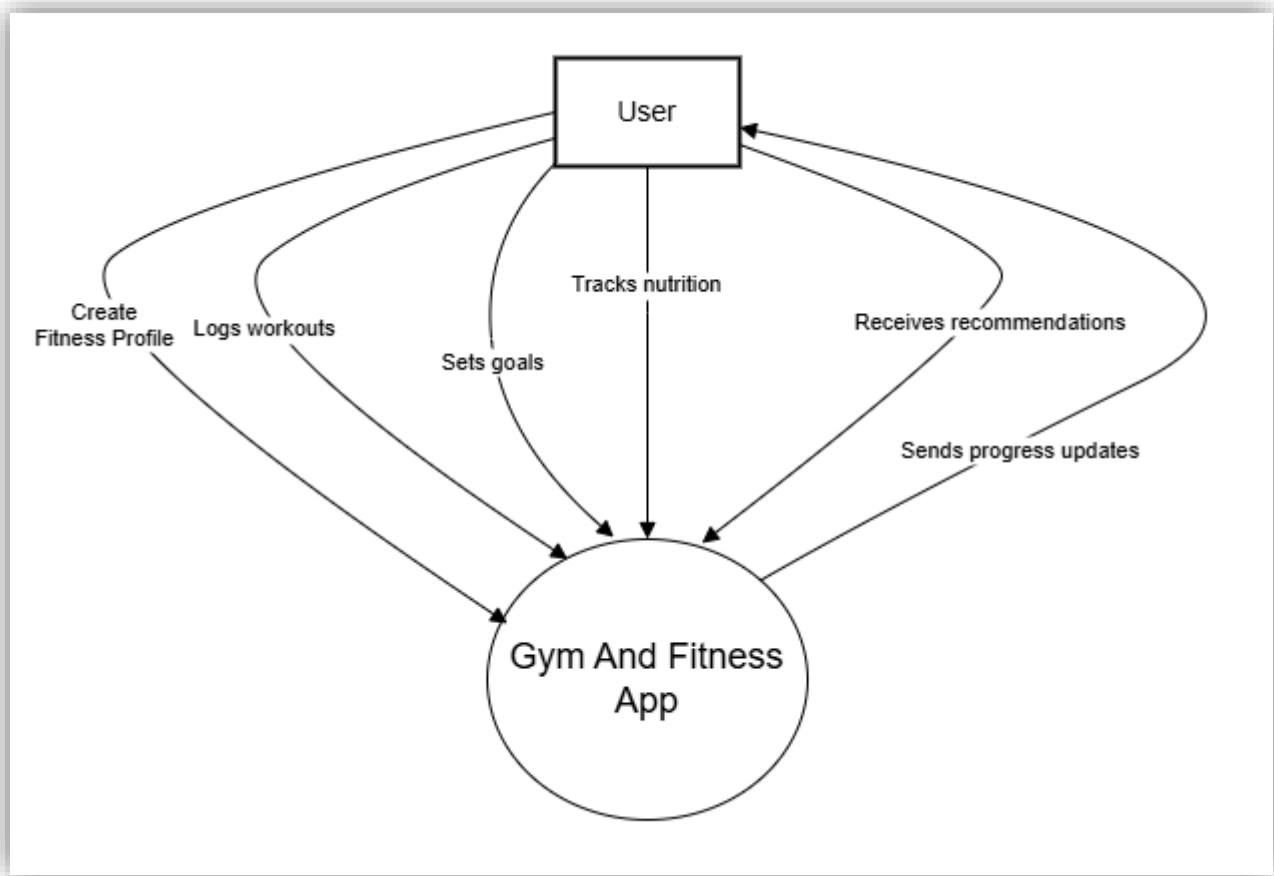




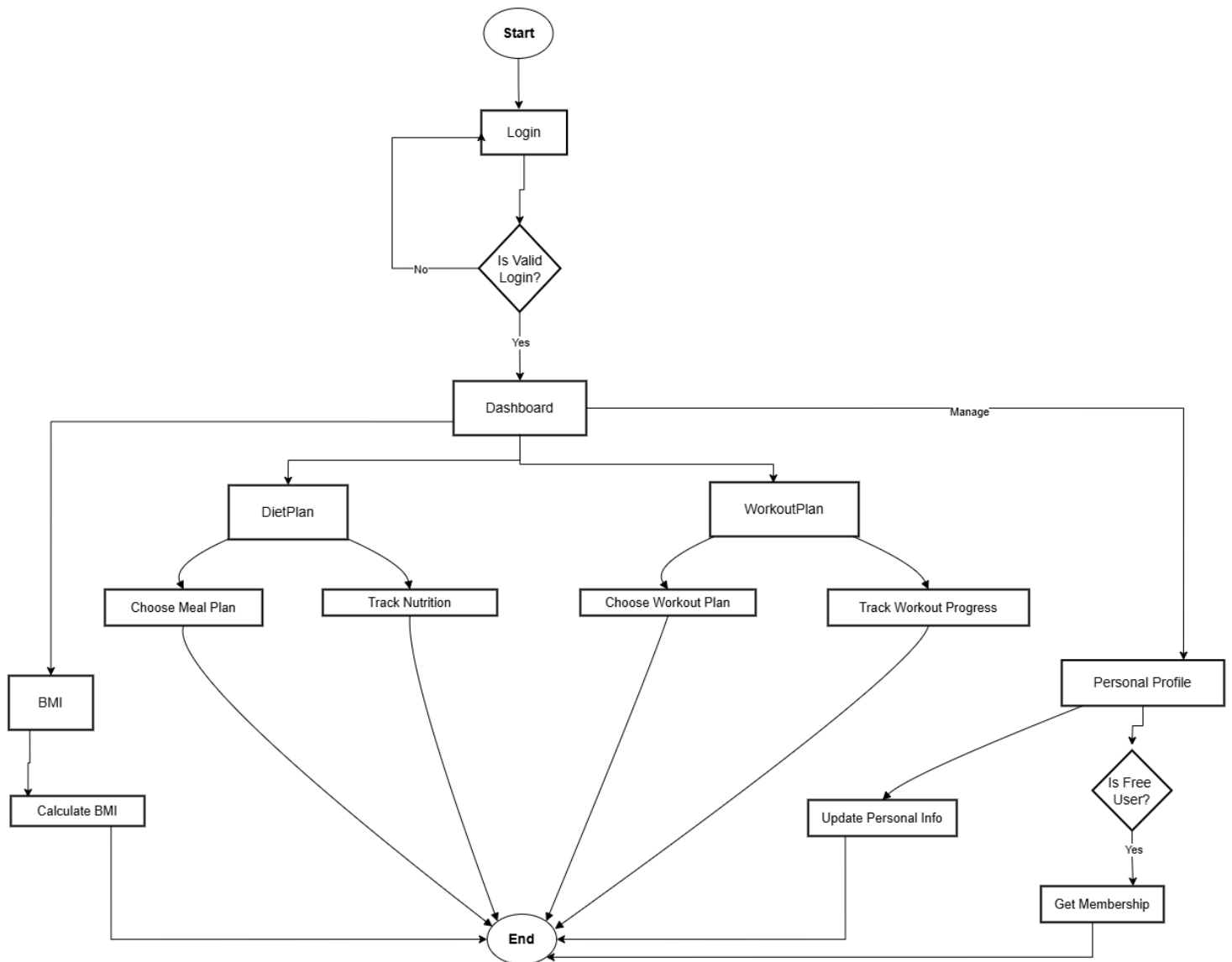
### 3.3.3. Sequence Diagram:



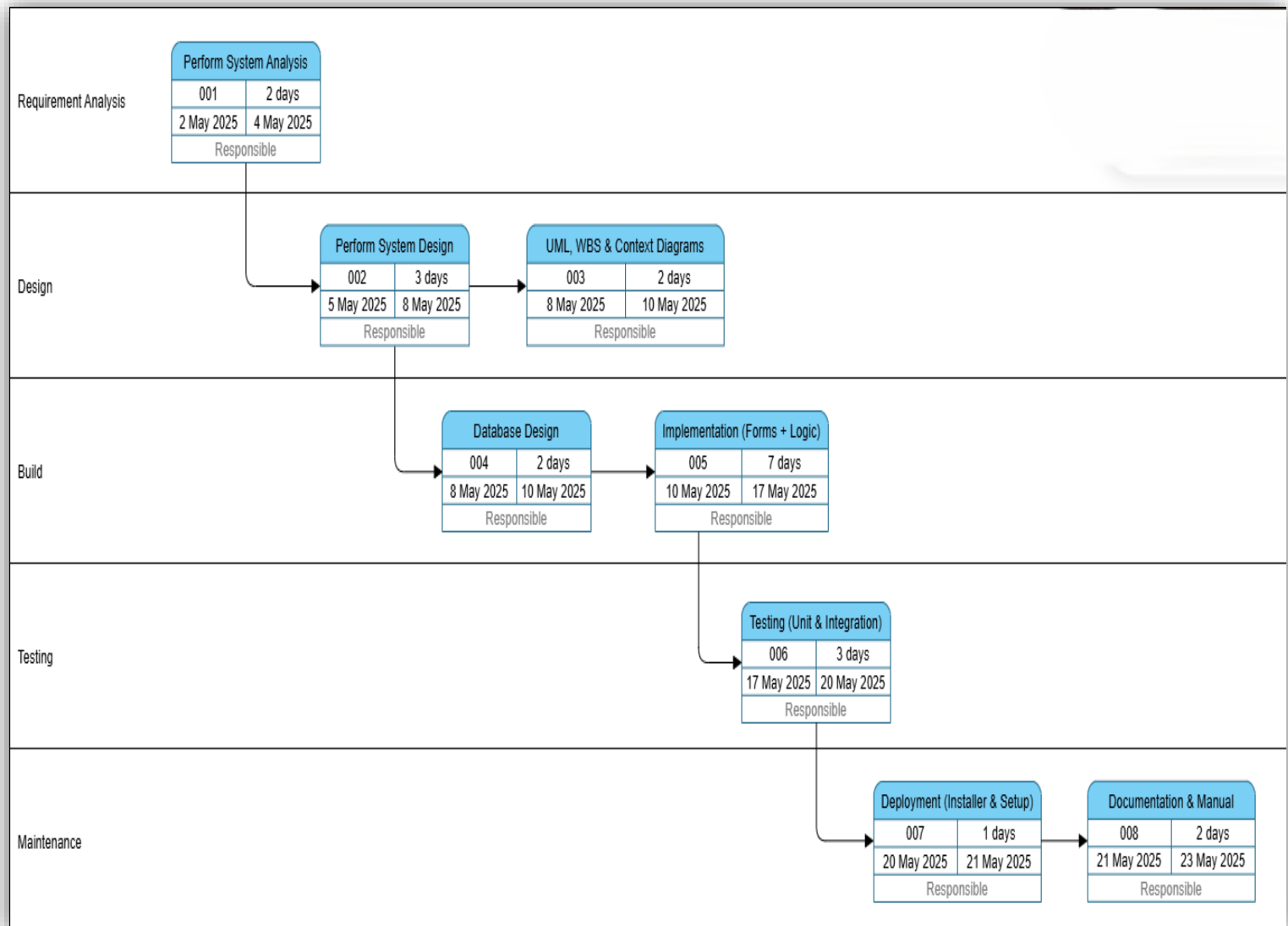
### 3.3.4. Context Diagram:



## 3.3.5. Activity Diagram



### 3.3.6. Planning diagram (PERT Chart):



## 4. SOFTWARE DEVELOPMENT METHODOLOGY

### 4.1. Chosen Methodology:

#### “WATERFALL MODEL”

##### ➤ Justification:

- Clear and fixed requirements
- One-time delivery for university project
- Easy to manage in short timeline

##### ➤ Phases:

1. Requirements
2. Design (UI + DB)
3. Implementation (Code)
4. Testing (Unit + Integration)
5. Deployment
6. Documentation

### 4.2. Version Control

- **Tool:** GitHub Desktop
- **Branches:** main, dev, feature/\*

### 4.3. Milestones

| Phase         | Completion Time |
|---------------|-----------------|
| Requirements  | Week 1          |
| Design        | Week 1,2        |
| Coding        | Week 2          |
| Testing       | Week 3          |
| Documentation | Week 4          |

## 5. RISK MANAGEMENT

### 5.1. Risk Identification & Mitigation

| Risk                           | Probability | Impact | Mitigation Strategy                                    |
|--------------------------------|-------------|--------|--|
| Requirement changes            | Medium      | High   | Frequent meetings with users to confirm needs          |
| Bugs in form logic             | High        | Medium | Code reviews and thorough testing                      |
| Database connection failure    | Low         | High   | Use robust error handling and local DB backups         |
| User forgets credentials       | Medium      | Medium | Implement "forgot password" feature                    |
| Deployment fails on target PCs | Low         | High   | Use ClickOnce installer with all prerequisites checked |

### 5.2. Risk Exposure (RE) & Risk Leverage (RL)

Formula:

- $RE = Probability \times Impact$
- $RL = (RE\_before - RE\_after) / Cost\ of\ solution$

| Risk                | RE Before               | RE After Mitigation     | Mitigation Cost | RL                         |
|---------------------|-------------------------|-------------------------|-----------------|----------------------------|
| Requirement changes | $0.6 \times 0.9 = 0.54$ | $0.3 \times 0.5 = 0.15$ | 0.1             | $(0.54 - 0.15)/0.1 = 3.9$  |
| Bugs in logic       | $0.8 \times 0.7 = 0.56$ | $0.3 \times 0.4 = 0.12$ | 0.05            | $(0.56 - 0.12)/0.05 = 8.8$ |

## 6. TESTING & VALIDATION

### 6.1. Testing Strategy

- Unit Testing:** For individual components like BMI calculator, login, forms.
- Integration Testing:** Ensure forms interact well with database.
- System Testing:** Complete workflow from login → usage → logout.
- User Acceptance Testing (UAT):** Final testing with actual user (yourself or friends).

## 6.2. Sample Test Case

|                        |   |
|------------------------|---|
| <b>Test Case ID</b>    | <b>TC-01</b>  |
| <b>Feature</b>         | Login Form  |
| <b>Test Steps</b>      | 1. Open app<br>2. Enter valid username & password<br>3. Click Login |
| <b>Expected Result</b> | Dashboard loads successfully  |
| <b>Status</b>          | Pass  |

## 7. DOCUMENTATION & MAINTENANCE

### 7.1. Documentation Plan

- **System Overview:** Purpose and flow of the fitness app.
- **UML Diagrams:** Class, use-case, activity, sequence, context.
- **Installation Guide:** How to install using ClickOnce.
- **User Manual:** How to use features (BMI, Membership, etc.).

### 7.2. Maintenance Strategy

- **Bug Fixes:** Maintain changelog and fix bugs periodically.
- **Updates:** Add new features (e.g., diet planner).
- **Backup Plan:** Regular DB backups recommended.

## 8. COST ESTIMATION (COCOMO MODEL)

Using Basic **COCOMO Model** for an **Organic Project**.

**Formula:**

$$\text{Effort (E)} = a \times (\text{KLOC})^b$$

$$\text{Time (T)} = c \times (E)^d$$

For Organic projects:

- $a = 2.4, b = 1.05$
- $c = 2.5, d = 0.38$

Assume:

- Project size = **5 KLOC** (5000 lines of code)

**Calculation:**

- $E = 2.4 \times (5)^{1.05} \approx 2.4 \times 5.28 \approx 12.67 \text{ person-months}$
- $T = 2.5 \times (12.67)^{0.38} \approx 2.5 \times 2.36 \approx 5.9 \text{ months}$

## 9. FINAL DELIVERABLES

### 9.1. Software Artifacts

- **Executable Application (.exe)** – A compiled and installable Windows Forms application via ClickOnce.
- **Project Source Code** – Complete C# codebase including forms, classes, and database connection logic.
- **Database Files** – SQL Server LocalDB (.mdf/.ldf) files used for data persistence.

### 9.2. Software Engineering Documents

- **Requirements Specification Document:** Functional and non-functional requirements, use-case descriptions.
- **System Design Documents:**
  - UML Class Diagram
  - Use Case Diagram
  - Sequence Diagram
  - Activity Diagram
  - Context Diagram



- Planning (PERT) Diagram
- Work Breakdown Structure (WBS)

### 9.3. Testing Documents

- **Test Plan:** Testing strategy for unit, integration, and system testing.
- **Test Cases Document:** Detailed list of test cases with expected vs actual results.
- **Bug/Issue Log:** Any identified bugs during testing and their resolution status.

### 9.4. Risk Management Report

- Risk Identification & Mitigation Table
- Risk Exposure (RE) and Risk Leverage (RL) calculations.

### 9.5. Cost Estimation

- **COCOMO Model Report:** Calculated effort, development time, and team size based on 5KLOC.

### 9.6. Documentation & Maintenance Plan

- **User Manual:** Instructions for using the software (Login, BMI Calculator, Membership Features, etc.)
- **Maintenance Strategy Document:** Plan for future updates, bug fixes, and feature enhancements.

## 10. CONCLUSION

The Gym & Fitness Windows Forms Application was developed following a systematic software engineering approach. From requirement analysis to cost estimation, all essential phases were addressed to ensure the application is functional, maintainable, and user-friendly. The use of UML diagrams, risk management strategies, and testing plans demonstrates the thorough planning and execution of this project. This software provides a solid foundation for future enhancements and deployment in real-world fitness environments.

## 11. REFERENCES

- Pressman, R. S. *Software Engineering: A Practitioner's Approach*, 8th Edition.
- Microsoft Docs. *Windows Forms Overview*. <https://learn.microsoft.com/en-us/dotnet/desktop/winforms/>
- GitHub Docs. *Understanding the GitHub Flow*. <https://docs.github.com/>

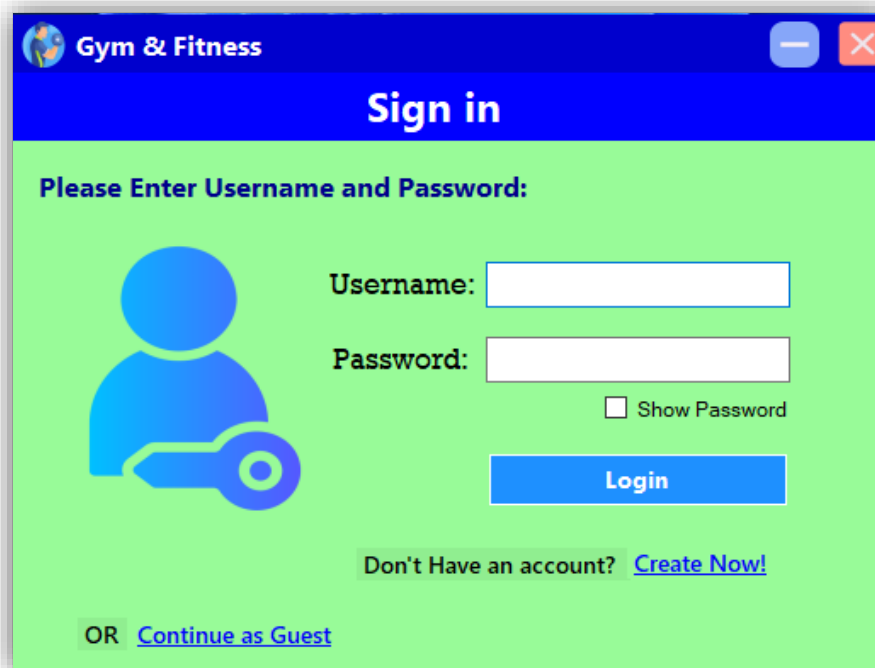
## 12. APPENDICES

### 12.1. Application Interfaces (Output Screenshots)

#### 12.1.1. LoadingForm



#### 12.1.2. LoginForm



## 12.1.3. MainForm



## 12.1.4. BMICalculatorForm

The screenshot shows the 'BMI Calculator' form. It features a blue header bar with the app's name 'Gym & Fitness' and a 'BMI Calculator' title. The form has a green background and includes input fields for 'Height (cm)' (172) and 'Weight (kg)' (65), a 'Calculate' button, and a 'Physique Info' section displaying the calculated BMI (21.97), BMI Category (Normal), and Target Weight Range (55kg - 74kg). On the right, there's a semi-circular gauge showing BMI ranges: Underweight (<18.5), Normal (18.5-24.9), Overweight (25-29.9), Obese (30-34.9), and Extremely Obese (>35). The needle points to the 'Normal' range. Below the gauge is a 'BODY MASS INDEX' label and a color-coded legend for the BMI ranges.

| BMI Range | Category        |
|-----------|-----------------|
| <18.5     | Underweight     |
| 18.5-24.9 | Normal          |
| 25-29.9   | Overweight      |
| 30-34.9   | Obese           |
| >35       | Extremely Obese |

## 12.1.5. DashboardForm



**Gym & Fitness** Logout

**Dashboard**

Welcome to Gym & Fitness App!

Friday, April 04, 2025  
08:17:23 AM

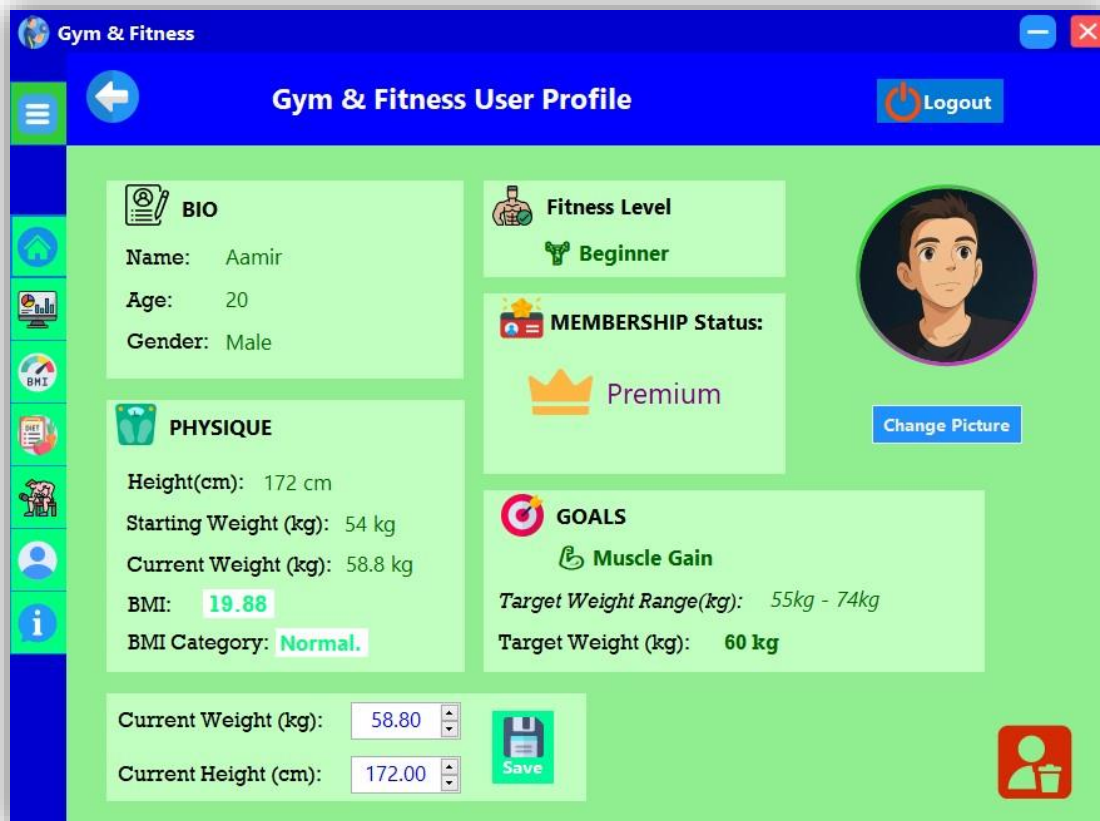
**Your only limit is your mind.**

**CHALLENGE SECTION**  
Accept it or leave!  
[Get your Challenge](#) Do if you can!

**Weight Progress:**  
**Fitness Progress: 53%**

**Daily Water Intake**  
Target Intake: **8 Glass**  
Current Intake Progress: **2 / 8 Glasses**  
[+ Add 1 Glass](#)  
\* It is recommended to drink 8 glass of water daily!

## 12.1.6. ProfileForm



**Gym & Fitness** Logout

**Gym & Fitness User Profile**

**BIO**  
Name: Aamir  
Age: 20  
Gender: Male

**Fitness Level**  
**Beginner**

**MEMBERSHIP Status:**  
**Premium**

**Change Picture**

**PHYSIQUE**  
Height(cm): 172 cm  
Starting Weight (kg): 54 kg  
Current Weight (kg): 58.8 kg  
BMI: **19.88**  
BMI Category: **Normal.**

**GOALS**  
**Muscle Gain**  
Target Weight Range(kg): 55kg - 74kg  
Target Weight (kg): **60 kg**

Current Weight (kg):   
Current Height (cm):   
[Save](#)

## 12.1.7. AboutForm

