

**Software Design and Analysis**

**Gym and Fitness Management System**

**Documentation**

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**1. Introduction**

**1.1 Purpose**

The Gym and Fitness Management System (GFMS) is designed to enhance the operational efficiency and user experience within a fitness center. It provides a centralized platform to manage memberships, workout and diet plans, equipment inventory, fitness classes, and other key functionalities. The system aims to replace traditional, manual gym management practices with a streamlined and automated solution, ensuring convenience for both gym members and staff.

**1.2 Scope**

**Domain:** Single fitness center operations, covering all aspects of member services and gym resources.

The GFMS will focus on:

* Membership registration and renewal.
* Scheduling and management of fitness classes.
* Customization and tracking of workout and diet plans.
* Efficient equipment usage and inventory management.
* Fee processing and locker assignments.
* An in-built shop interface for gym-related products.

This system is targeted to provide a scalable, user-friendly, and secure solution to simplify daily gym operations.

**1.3 Title**

**Gym and Fitness Management System (GFMS)**  
"Empowering Fitness Centers with Seamless Operations"

**1.4 Objectives**

* Centralize gym operations to improve productivity and reduce redundancy.
* Automate essential processes like membership tracking, fee management, and workout scheduling.
* Enable members to access real-time fitness reports and book classes conveniently.
* Provide tools for staff to efficiently manage equipment, classes, and member requests.
* Deliver a robust platform that integrates additional services like product sales.

**1.5 Problem Statement**

Traditional gym management methods are often fragmented and rely heavily on manual intervention, leading to inefficiencies and service delays. Members encounter inconveniences in scheduling classes, accessing diet plans, or raising complaints, while staff struggle with resource tracking and operational bottlenecks.

The GFMS addresses these challenges through an integrated solution that centralizes all operations under one platform. By minimizing manual dependency and introducing real-time tracking and reporting, the system aims to enhance both staff productivity and member satisfaction.

**2. Overall Description**

**2.1 Product Perspective**

The **Gym and Fitness Management System (GFMS)** is a standalone software designed to simplify the daily operations of a fitness center. It integrates key functionalities such as membership management, class scheduling, and inventory tracking into a single user-friendly platform. The system automates repetitive tasks and ensures accuracy, thereby enhancing the overall efficiency and user experience for both gym members and staff.

The GFMS will utilize:

* A **web-based interface** for accessibility across devices.
* A **centralized database** for real-time updates and secure storage of user and operational data.
* **Role-specific portals** tailored for different users such as members, trainers, and administrators.

This software is intended to replace traditional, manual systems and fragmented tools, providing a streamlined and cohesive approach to gym management.

**2.2 Product Functions**

The GFMS will support the following core functionalities:

1. **Membership Management**: Register new members, renew subscriptions, and manage account details.
2. **Workout and Diet Plans**: Create and customize workout and diet plans based on individual fitness goals.
3. **Fitness Class Scheduling**: Enable members to book and manage class schedules in real-time.
4. **Equipment Management**: Track inventory, schedule maintenance, and ensure efficient utilization.
5. **Locker Assignments**: Assign lockers to members and manage availability.
6. **Complaint Resolution**: Provide a streamlined process for members to lodge and track complaints.
7. **Fee Management**: Process payments for memberships, classes, and other services.
8. **Shop Interface**: Facilitate the sale of gym-related products and accessories.
9. **Progress Tracking**: Generate detailed fitness reports for members, covering workout progress and achievements.

**2.3 List of Use Cases**

1. **Register New Member**: Allow the receptionist to register new gym members efficiently.
2. **Create Workout Plan**: Enable trainers to design personalized workout routines.
3. **Process Membership Fee**: Streamline the payment and renewal of memberships.
4. **Manage Gym Equipment**: Facilitate inventory management and equipment tracking.
5. **Assign Locker**: Allocate lockers to members and monitor their status.
6. **Generate Fitness Report**: Help trainers create detailed progress reports for members.
7. **Schedule Fitness Class**: Allow members to book and manage fitness classes.
8. **Manage Diet Plan**: Enable trainers to create tailored diet plans for members.
9. **Process Complaints**: Provide a system for members to report issues and for staff to resolve them.
10. **Sell Shop Items**: Facilitate the sale of gym merchandise and track inventory.

**2.4 Extended Use Cases**

**Use Case 1: Register New Member**

**Use Case Name:** Register New Member

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Receptionist

**Stakeholders and Interests:** Gym management needs new member registrations for business growth.

**Preconditions:** Receptionist is logged into the system.

**Postconditions:** New member is successfully registered in the system.

**Main Success Scenario:**

1. Receptionist navigates to the new member registration page.
2. Receptionist enters member's personal details.
3. System validates the entered information.
4. Receptionist selects membership plan.
5. System calculates fees.
6. Receptionist confirms the registration.
7. System creates new member account and generates member ID.
8. System sends welcome email to the new member.

**Extensions:**

2a. If required fields are left blank, system prompts for completion.

3a. If information is invalid, system requests correction.

5a. If selected plan is unavailable, system suggests alternatives.

**Use Case 2: Create Workout Plan**

**Use Case Name:** Create Workout Plan

**Scope:** Gym and Fitness Management System

**Level:** User   
**Primary Actor:** Trainer

**Stakeholders and Interests:** Members need personalized workout plans for fitness goals.

**Preconditions:** Trainer is logged in, member exists in system.

**Postconditions:** Personalized workout plan is created and assigned to member.

**Main Success Scenario:**

1. Trainer navigates to workout plan creation page.
2. Trainer selects member from list.
3. System displays member's fitness profile.
4. Trainer designs workout plan based on member's goals and fitness level.
5. Trainer sets duration and frequency of workouts.
6. Trainer submits the plan.
7. System saves the plan and notifies the member.

**Extensions:**

2a. If member doesn't exist, system prompts to create new member profile.

4a. If trainer wants to use a template, system provides pre-designed plans.

6a. If plan conflicts with member's health conditions, system warns trainer.

Use Case 3: Process Membership Fee

**Use Case Name:** Process Membership Fee

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Shopkeeper

**Stakeholders and Interests:** Gym needs to collect fees for financial sustainability. **Preconditions:** Shopkeeper is logged in, member account exists.

**Postconditions:** Fee is collected and member account is updated.

**Main Success Scenario:**

1. Shopkeeper navigates to fee collection page.
2. Shopkeeper enters member ID.
3. System displays member's fee details.
4. Shopkeeper enters payment amount and method.
5. System processes the payment.
6. System updates member's account status.
7. System generates and prints receipt.

**Extensions:**

2a. If member ID is invalid, system displays error message.

4a. If payment amount is incorrect, system alerts shopkeeper.

5a. If payment processing fails, system suggests alternative payment methods.

**Use Case 4: Manage Gym Equipment**

**Use Case Name:** Manage Gym Equipment

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Admin

**Stakeholders and Interests:** Gym needs to maintain updated equipment inventory. **Preconditions:** Admin is logged into the system.

**Postconditions:** Equipment inventory is accurately updated.

**Main Success Scenario:**

1. Admin navigates to equipment management page.
2. System displays current equipment inventory.
3. Admin selects action (add, update, or remove equipment).
4. Admin enters equipment details.
5. System validates the information.
6. Admin confirms the action.
7. System updates the equipment inventory.

**Extensions:**

3a. If removing equipment, system checks for any scheduled maintenance.

5a. If entered information is incomplete, system prompts for missing details.

7a. If update affects scheduled classes, system notifies relevant trainers.

**Use Case 5: Assign Locker**

**Use Case Name:** Assign Locker

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Receptionist

**Stakeholders and Interests:** Members need secure storage for personal belongings. **Preconditions:** Receptionist is logged in, member exists in system.

**Postconditions:** Locker is assigned to member.

**Main Success Scenario:**

1. Receptionist navigates to locker assignment page.
2. Receptionist enters member ID.
3. System displays available lockers.
4. Receptionist selects a locker.
5. System confirms locker assignment.
6. System updates locker status.
7. System notifies member of locker number and access code.

**Extensions:**

2a. If member ID is invalid, system displays error message.

3a. If no lockers are available, system suggests joining waiting list.

5a. If member already has a locker, system prompts for confirmation to reassign.

**Use Case 6: Generate Fitness Report**

**Use Case Name:** Generate Fitness Report

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Trainer

**Stakeholders and Interests:** Members need progress tracking for motivation. **Preconditions:** Trainer is logged in, member has workout history.

**Postconditions:** Fitness report is generated and available to member.

**Main Success Scenario:**

1. Trainer navigates to report generation page.
2. Trainer selects member from list.
3. System retrieves member's workout data.
4. Trainer selects report parameters (time period, metrics).
5. System generates report based on selected parameters.
6. Trainer reviews and approves report.
7. System saves report and notifies member.

**Extensions:**

2a. If member has no workout history, system notifies trainer.

5a. If data is insufficient for selected parameters, system suggests alternatives.

6a. If trainer requests changes, system allows report modification.

**Use Case 7: Schedule Fitness Class**

**Use Case Name:** Schedule Fitness Class

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Member

**Stakeholders and Interests:** Members want to join group fitness activities. **Preconditions:** Member is logged into the system.

**Postconditions:** Member is registered for the fitness class.

**Main Success Scenario:**

1. Member navigates to class schedule page.
2. System displays available classes.
3. Member selects desired class and time slot.
4. System checks class availability.
5. Member confirms class registration.
6. System registers member for the class.
7. System sends confirmation email with class details.

**Extensions:**

3a. If class is full, system suggests alternative times or waitlist option.

4a. If member's membership doesn't cover the class, system prompts for additional payment.

6a. If scheduling conflict exists, system alerts member and requests confirmation.

**Use Case 8: Manage Diet Plan**

**Use Case Name:** Manage Diet Plan

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Trainer

**Stakeholders and Interests:** Members need nutritional guidance for health goals. **Preconditions:** Trainer is logged in, member exists in system.

**Postconditions:** Personalized diet plan is created or updated for member.

**Main Success Scenario:**

1. Trainer navigates to diet plan management page.
2. Trainer selects member from list.
3. System displays member's health profile and any existing diet plan.
4. Trainer creates or modifies diet plan.
5. Trainer enters meal details, calorie targets, and nutritional guidelines.
6. System validates the plan against health standards.
7. Trainer submits the plan.
8. System saves the plan and notifies the member.

**Extensions:**

3a. If member has no health profile, system prompts trainer to create one.

6a. If plan conflicts with member's health conditions, system warns trainer.

7a. If plan is an update, system archives the old plan for reference.

**Use Case 9: Process Complaint**

**Use Case Name:** Process Complaint

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Receptionist

**Stakeholders and Interests:** Members need issues addressed for satisfaction. **Preconditions:** Receptionist is logged in.

**Postconditions:** Complaint is registered and assigned for resolution.

**Main Success Scenario:**

1. Receptionist navigates to complaint management page.
2. Receptionist enters member ID and complaint details.
3. System categorizes the complaint.
4. Receptionist assigns priority level.
5. System generates unique complaint ID.
6. Receptionist assigns complaint to relevant department.
7. System logs the complaint and notifies assigned department.
8. System sends acknowledgment to the member.

**Extensions:**

2a. If member ID is invalid, system allows complaint registration for non-members. 3a. If complaint category is unclear, receptionist can create custom category.

6a. If assigned department is unavailable, system suggests alternative assignments.

**Use Case 10: Sell Shop Items**

**Use Case Name:** Sell Shop Items

**Scope:** Gym and Fitness Management System

**Level:** User

**Primary Actor:** Shopkeeper

**Stakeholders and Interests:** Gym needs to manage and track sales of fitness products.

**Preconditions:** Shopkeeper is logged in, inventory is up to date.

**Postconditions:** Sale is recorded and inventory updated.

**Main Success Scenario:**

1. Shopkeeper navigates to point of sale page.
2. Shopkeeper scans or enters item codes.
3. System displays item details and price.
4. Shopkeeper enters quantity for each item.
5. System calculates total price.
6. Shopkeeper processes payment.
7. System generates receipt and updates inventory.
8. System records sale in financial logs.

**Extensions:**

2a. If item is not found, system allows manual entry of details.

4a. If requested quantity exceeds available stock, system alerts shopkeeper.

6a. If payment fails, system allows alternative payment methods or cancellation.

**2.5 Use Case Diagram**

A diagram of a gym and fitness management system

Description automatically generated

**3. Other Non-Functional Requirements**

**3.1 Performance Requirements**

The Gym and Fitness Management System (GFMS) is designed to ensure optimal performance for both members and staff. Key performance metrics include:

* **System Response Time**: Transactions, such as member registration or locker assignment, should complete within 2-3 seconds.
* **Concurrent User Support**: The system must support up to 100 simultaneous users without performance degradation.
* **Data Retrieval Speed**: Reports, schedules, and member details must load within 5 seconds under normal operational loads.

**3.2 Safety Requirements**

The GFMS prioritizes user safety and data integrity. Measures include:

* **Error Handling**: The system should display appropriate error messages for invalid actions (e.g., entering incorrect login credentials or accessing unauthorized areas).
* **Backup Protocols**: Daily backups ensure data recovery in case of system failures or crashes.
* **Operational Security**: Secure operations ensure no physical harm to equipment or misuse of locker systems.

**3.3 Security Requirements**

The system employs robust security measures to safeguard user data and prevent unauthorized access:

* **User Authentication**: All users must log in with a secure username and password. Two-factor authentication is optional for enhanced security.
* **Data Encryption**: Sensitive information, such as payment details and health records, is encrypted in transit and at rest.
* **Role-Based Access Control**: Features and data are accessible based on the user’s role (e.g., admin, member, trainer).

**3.4 Software Quality Attributes**

The GFMS adheres to high-quality standards in software development:

* **Reliability**: The system ensures uptime of 99.9% during operational hours.
* **Usability**: Intuitive interfaces and clear navigation improve the user experience for non-technical users.
* **Scalability**: Designed to support future expansion, such as adding new features or handling larger membership bases.
* **Maintainability**: Modular design allows easy updates and debugging.

**3.5 Business Rules**

The GFMS enforces rules to streamline gym operations and ensure fairness:

* Membership renewals are allowed only if there are no outstanding dues.
* Locker assignments are strictly for active members.
* Only trainers can access and modify diet plans or workout schedules for members.
* All payments must be processed through authorized channels integrated into the system.

**3.6 Operating Environment**

The GFMS is designed for flexibility and compatibility across platforms:

* **Supported Devices**: Works on desktops, tablets, and smartphones with modern web browsers.
* **Operating Systems**: Compatible with Windows, macOS, Linux, Android, and iOS.
* **Database and Hosting**: Hosted on a cloud-based SQL database ensuring high availability and scalability.

**3.7 User Interfaces**

The Gym and Fitness Management System offers a user-friendly interface that allows gym administrators and staff to manage various aspects of the gym effectively. The system's main dashboard is intuitive, with a bold and straightforward layout that ensures ease of navigation and clarity in functionality.

**Main Features:**

* **Dashboard Accessibility:** The main page of the dashboard provides quick access to all critical operations such as handling machines, managing staff, and assigning lockers, ensuring that users can navigate efficiently between tasks.
* **Login Simplicity:** The login screen is designed for ease, requiring only username and password, thus offering straightforward access to the system’s features without unnecessary complexity.
* **Functional Menus:** Each menu item on the dashboard is clearly labeled (e.g., 'Handle Machines', 'Manage Staff', 'Repair Machines'), directing users seamlessly to the required tasks without confusion. Sub-menus for specific actions like adding, updating, or viewing details are visually distinct and easy to select.
* **Interactive Forms:** Forms for entering data, such as in 'Staff Details' or 'Locker Assignment', are designed to be user-friendly, with labeled fields that reduce input errors and enhance user interaction.
* **Feedback Mechanisms:** The interface incorporates immediate feedback mechanisms, such as confirmation messages upon successful completion of an action (e.g., 'Staff Added', 'Locker Assigned'), ensuring users are always aware of the system's status.
* **Error Handling:** The system is also designed to provide clear error messages if the user fails to fill out fields correctly, enhancing usability by guiding users to correct mistakes promptly.
* **Logout Functionality:** A logout button is readily accessible on all pages, allowing users to securely exit their session, which is a critical feature for maintaining the security of user data.

**Design Aesthetics:**

* **Color Scheme and Icons:** The use of a consistent and contrasting color scheme (black and orange) not only makes the interface visually appealing but also aids in highlighting important areas and buttons, ensuring that users can quickly identify clickable elements.
* **Responsive Design:** The interface adjusts smoothly across different devices and screen sizes, ensuring that it is accessible and functional both on desktops and mobile devices.
* **Iconography:** Use of intuitive icons next to textual descriptions enhances the visual clarity and helps in faster navigation.

A screenshot of a fitness app

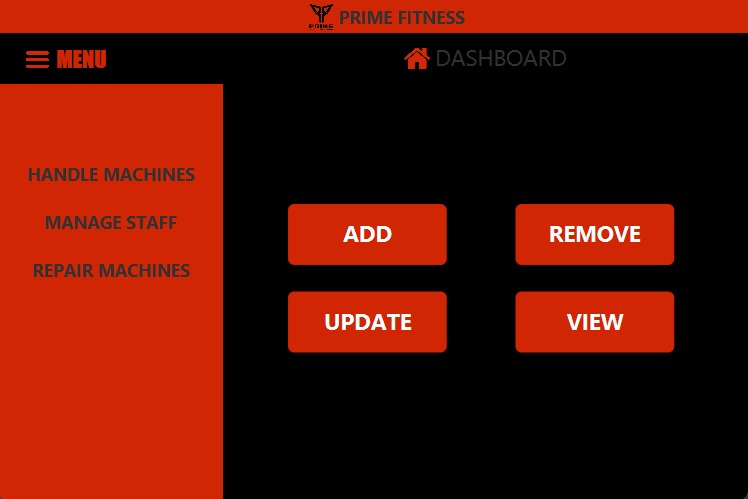
Description automatically generated

A login screen with a logo

Description automatically generated

A black and red logo

Description automatically generated



A screenshot of a diet plan

Description automatically generated

A screenshot of a locker login

Description automatically generated

A screen shot of a computer

Description automatically generated

A screenshot of a web page

Description automatically generated

**4. Diagrams**

***Sequence Diagram***

