
Software Requirements Specification

for

FPT HR Learning System

Version <1.0.1>

Prepared by

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REVISIONS

Version	Primary Author(s)	Description of Version	Date Completed
1.0	Bui Nguyen Ngoc Han Than Thi Bich Hang Ngo Thi Khanh Chi Pham Xuan Hai Nguyen Ha Thai Thinh Truong Hoang Anh Dung	This is the first version, including functions such as login, registration, management: trainee account, trainer account, training staff account, category, course, topic.	17/02/2024
1.0.1	Bui Nguyen Ngoc Han Than Thi Bich Hang Ngo Thi Khanh Chi Pham Xuan Hai Nguyen Ha Thai Thinh Truong Hoang Anh Dung	This is the next version that is improved over the first version. This version also includes login, registration, and management functions: trainee account, trainer account, training staff account, category, course, topic.	04/03/2024

Table 1: Revisions

1. INTRODUCTION (P1)

1.1. Document Purpose

The SRS document (Software Requirement Specification) is an important document in the software development process. For the project of developing a "Training" activity management system for the FPT company's internal training program, this document plays an important role in ensuring that the final system will meet the needs and expectations of users. SRS provides a detailed description of what the system needs to do, including specific functions, performance requirements, and other requirements. It also provides a standard that we can use to evaluate whether the system meets the requirements. By clearly defining requirements from the start, SRS helps reduce the risks associated with development going off the rails or failing to meet user requirements. SRS also helps all stakeholders understand system requirements and goals, and provides the information needed to plan, estimate, and track project progress.

1.2. Product Scope

This software requirements specification document was built to serve the project of developing a system, which manages the activity of "Training" for internal training program of the FPT company. With the development of an online learning system, we provide customers, organizations and individuals with a tool that comes with traditional teaching and learning methods. This system can be used for student account management, instructor management, course catalog management, course management, topic management, topic assignment for courses, instructor assignment According to topic, assign students to participate in the course. This is a system used by the human resources department. It will provide software to manage the company's internal operations.

1.3. Intended Audience and Document Overview

a. Intended Audience

Training staff: Human resources staff oversee training programs, track employee progress, and ensure training meets company goals and complies with any relevant regulations.

- Objective: Gain a clear understanding of how the system will help them manage aspects of the training program.
- Required: Details on how the system will track and report on training progress, manage resources and assets, identify training needs, and manage employee training information.

Trainer: These individuals are responsible for delivering the training. They need to understand the system to effectively plan, schedule, and execute training sessions.

- Objective: Understand how the system will support them during the implementation of the training program.
- Requirements: Details about the features and interfaces they will use to design, deploy, monitor, and evaluate the training program. Information is also needed on how the system supports student interaction.

Trainee: These are the main users who will participate in training programs. They need to understand the schedule, content and objectives of the training.

- **Objective:** Understand their experience while participating in the training program.
- **Requirements:** Details on how they will register, participate and complete training courses. The user interface, interactive features, and how they can track their training progress should be described.

Admin: Managers and executives can use the system to monitor the effectiveness of training programs, make informed decisions about future training, and ensure programs are aligned with goals Company strategy.

- **Objective:** Understand how the system will integrate and operate within the company's overall system environment.
- **Requirements:** Information about system requirements, integration with other systems, and security regulations to ensure system safety and stability.

IT staff: IT may need to understand the system to provide technical support, handle system updates, and manage any issues that arise.

- **Objective:** Understand how the system is designed and how specific features are implemented.
- **Requirements:** Details on system architecture, application programming interfaces (APIs), technologies and development tools used.

b. Document Overview

This SRS (Software Requirement Specification) document includes the following sections:

- **General description:** This section introduces the system, including goals, context, and definitions of terms.
- **Functional requirements:** This section describes in detail the functions of the system.
- **Non-functional requirements:** This section describes performance, security, user interface, and other requirements that are not directly related to the functionality of the system.

Below is our suggested reading sequence for each of the readers mentioned earlier:

- **Admin:** Start from the overview to understand the system, then read the functional and non-functional requirements to grasp the technical and business requirements.
- **IT staff:** Start with an overview, then focus on functional and non-functional requirements. Support information is also very important for this group.
- **Training staff and Trainer:** Start with an overview, then focus on functional requirements related to training management and tracking.
- **Trainee:** Starts with an overview, then focuses on functional requirements related to using the system to participate in training courses.

1.4. Definitions, Acronyms and Abbreviations

SRS (Software Requirement Specification)	Document that describes the functional and non-functional requirements of the software to be developed.
Use case diagram	Represents the system's functional diagram. Each use case describes the functionality that the system needs to have from the user's perspective.
UML (Unified Modeling Language)	A modeling language consisting of graphical symbols that object-oriented methods use to design information systems.
Activity diagram	Drawings describing the system's business processes.

Table 2: Definitions, Acronyms and Abbreviations

1.5. Document Conventions

This document has been written in accordance with IEEE formatting requirements. We use Crambria font size 12 for the document. Headings and subheadings will be bolded. We will also provide complete lists, tables, diagrams and other sections to make the document clearer and easier to understand. For documents referenced from other information sources, we will also cite the full source.

1.6. References and Acknowledgments

IEEE Editorial Style Manual. (n.d.). Available at: https://www.ieee.org/content/dam/ieee-org/ieee/web/org/conferences/style_references_manual.pdf.

Caulfield, J. (2022). IEEE Paper Format | Template & Guidelines. [online] Scribbr. Available at: <https://www.scribbr.com/ieee/ieee-paper-format/> [Accessed 30 Jan. 2024].

Purdue.edu. (2018). General Format - Purdue OWL® - Purdue University. [online] Available at: https://owl.purdue.edu/owl/research_and_citation/ieee_style/ieee_general_format.html [Accessed 30 Jan. 2024].

2. OVERALL DESCRIPTION PRODUCT (P1)

2.1. Product Overview

The management system for a company's internal training program is a software application designed to manage "Training" activities. The Internal Training Management System aims to provide a complete and effective platform to organize, track, and evaluate the company's internal training process. With a friendly interface and diverse features, this product helps optimize the training experience for both learners and managers.

The system provides a user-friendly interface to manage all training activities from a single platform, improving operational efficiency and minimizing manual errors. It is designed to process large volumes of data, provide real-time insights into training activities, and enable companies to make data-driven decisions.

2.2. Product Functionality

The Internal Training Management System provides many functions to manage various training activities. These functions include:

- Login: This function is intended to authenticate users when interacting with the system to provide rights and scope of access to the system.
- Registration: To access and use the system, users first need to register for an account.
- Trainee Account Management: This function allows administrators to add, edit, and delete information in the system, assign or change trainee usernames and passwords, and search for students.
- Trainer Management: This function allows administrators to add, edit, and delete information in the system and assign or change trainer usernames and passwords.
- Category Management: Allows administrators to add, edit, delete and search categories in the system.
- Course Management: Allows administrators to add, edit, delete and search courses in the system.
- Topic management: Allows management of common topics used in courses.
- Assign Topics to Courses: Allows management to assign topics to each specific course.
- Assign Trainers to Topic: Allows management to assign topics to each specific course.
- Assign Trainees to Courses: Allows management to assign topics to each specific course.

These functions are designed to provide a comprehensive solution to help companies manage training activities effectively. The system's user-friendly interface and automation enhance operational efficiency and reduce manual error.

2.3. Design and Implementation Constraints

2.3.1. Database Diagram

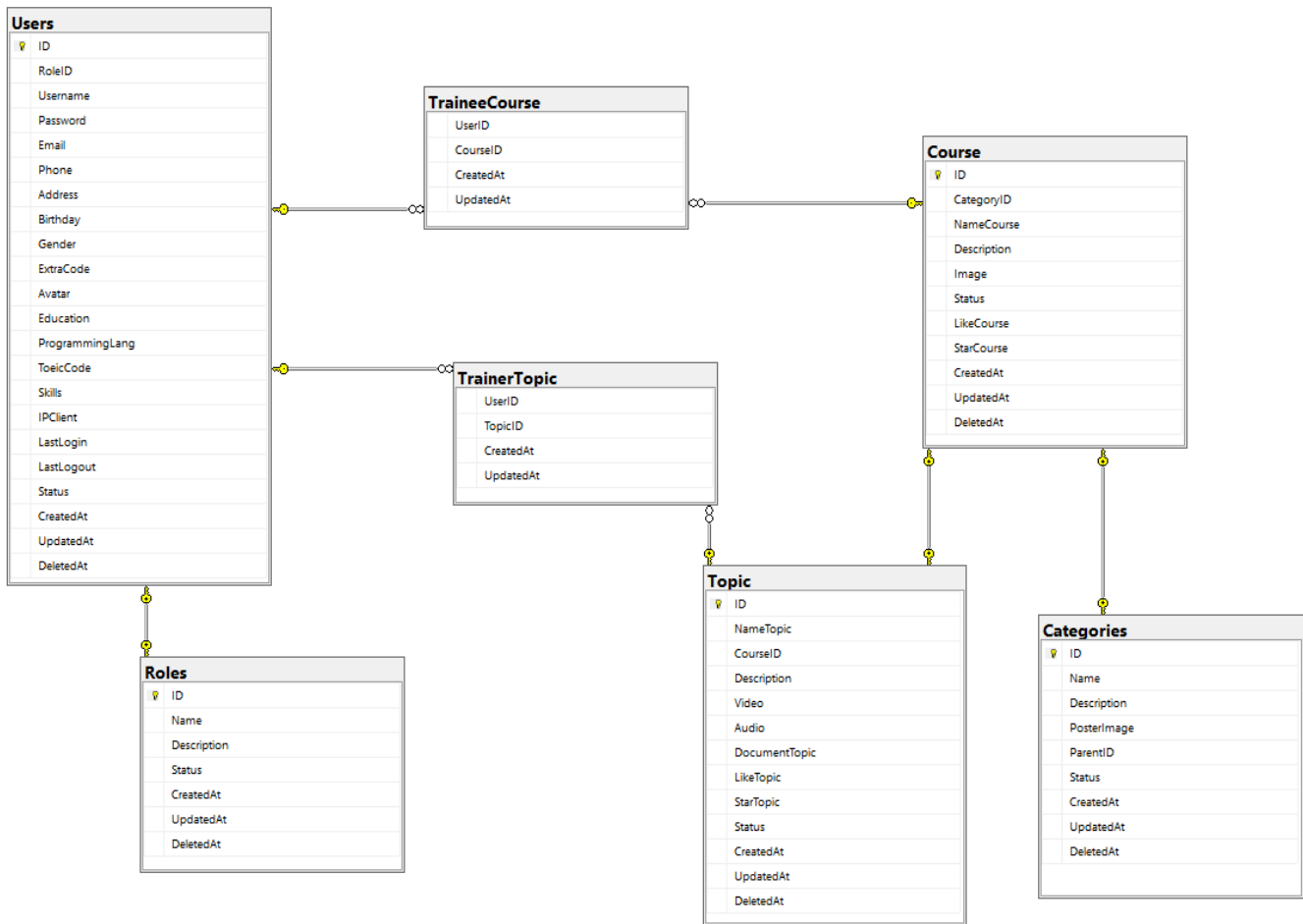


Figure 1: Database diagram

2.3.2. Usecase Diagram

Overview Usecase Diagram

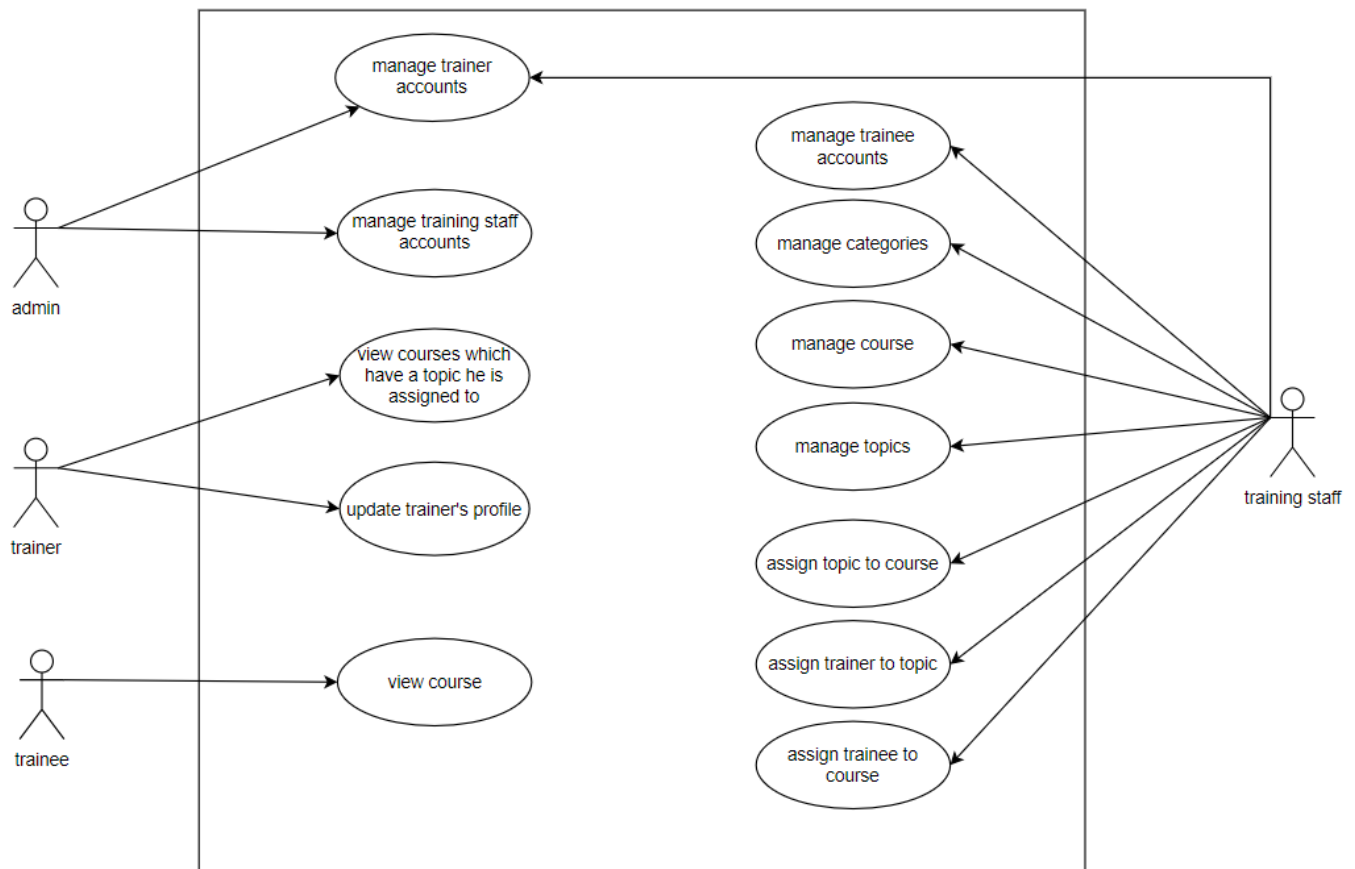


Figure 2: Overview Usecase diagram

2.3.3. Detailed Usecase Diagram

Usecase decomposition for “Training staff”

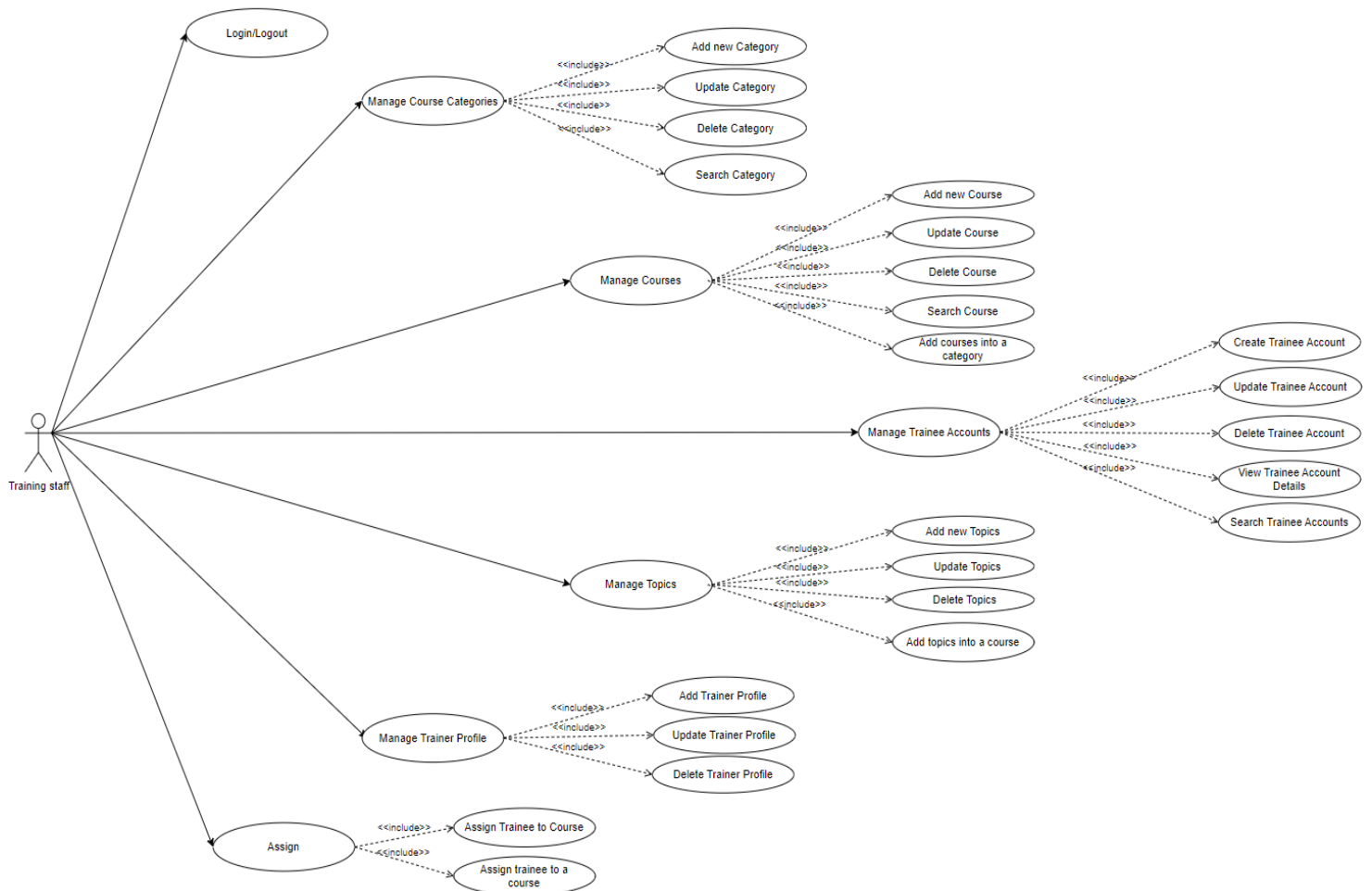


Figure 3: Usecase decomposition for “Training staff”

Usecase decomposition for “Admin”

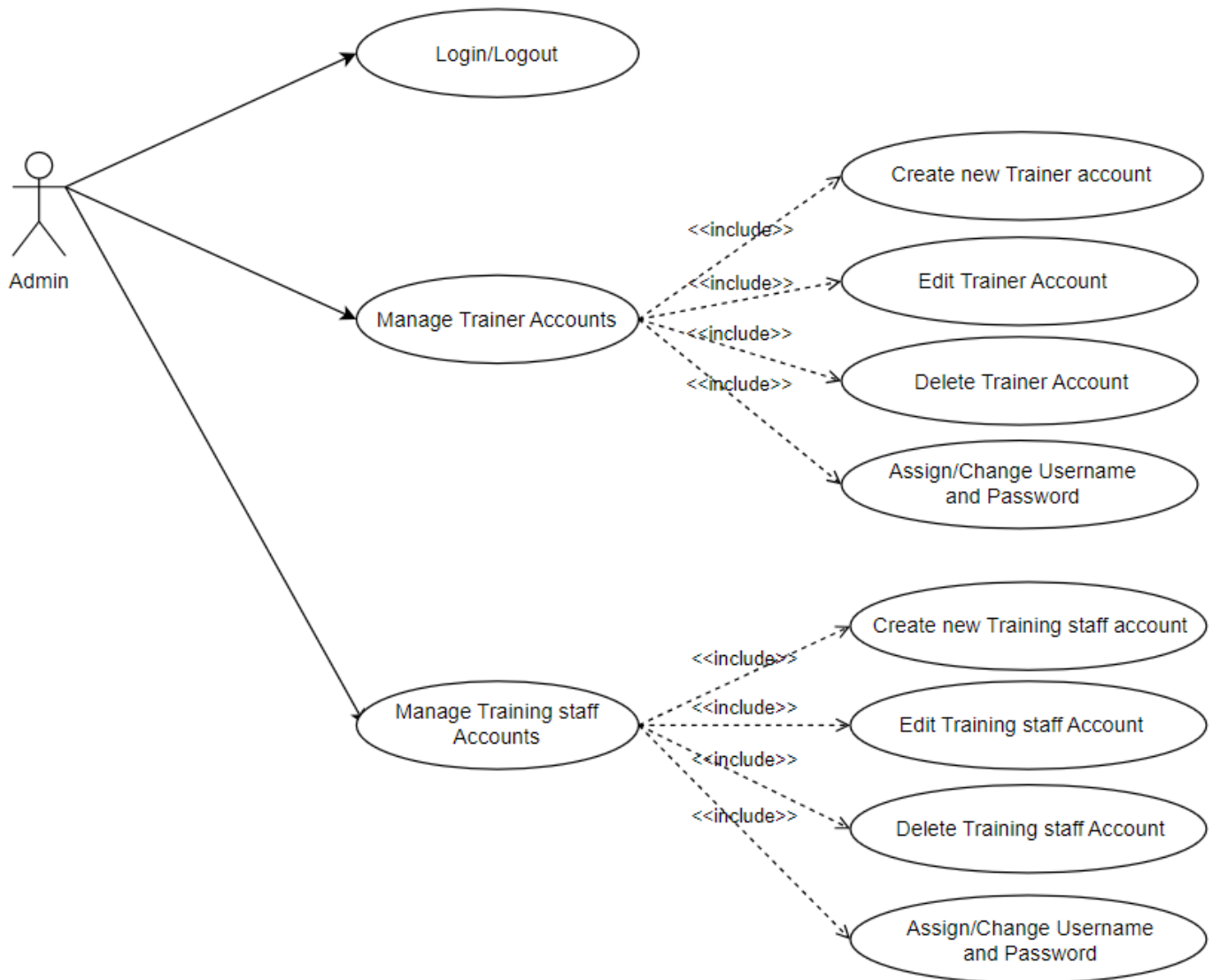


Figure 4: Usecase decomposition for “Admin”

Usecase decomposition for “Trainer”

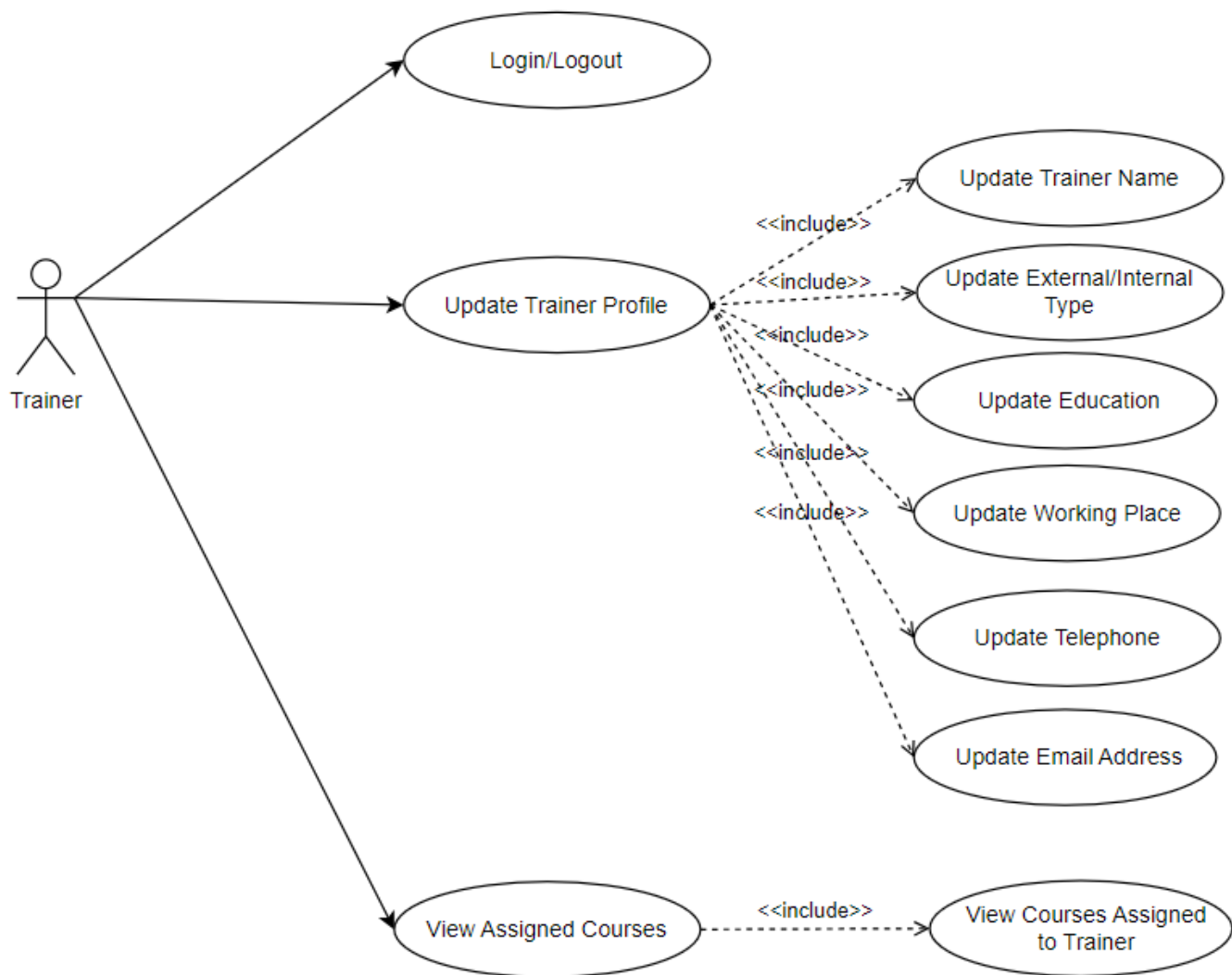


Figure 5: Usecase decomposition for “Trainer”

2.3.4. UML

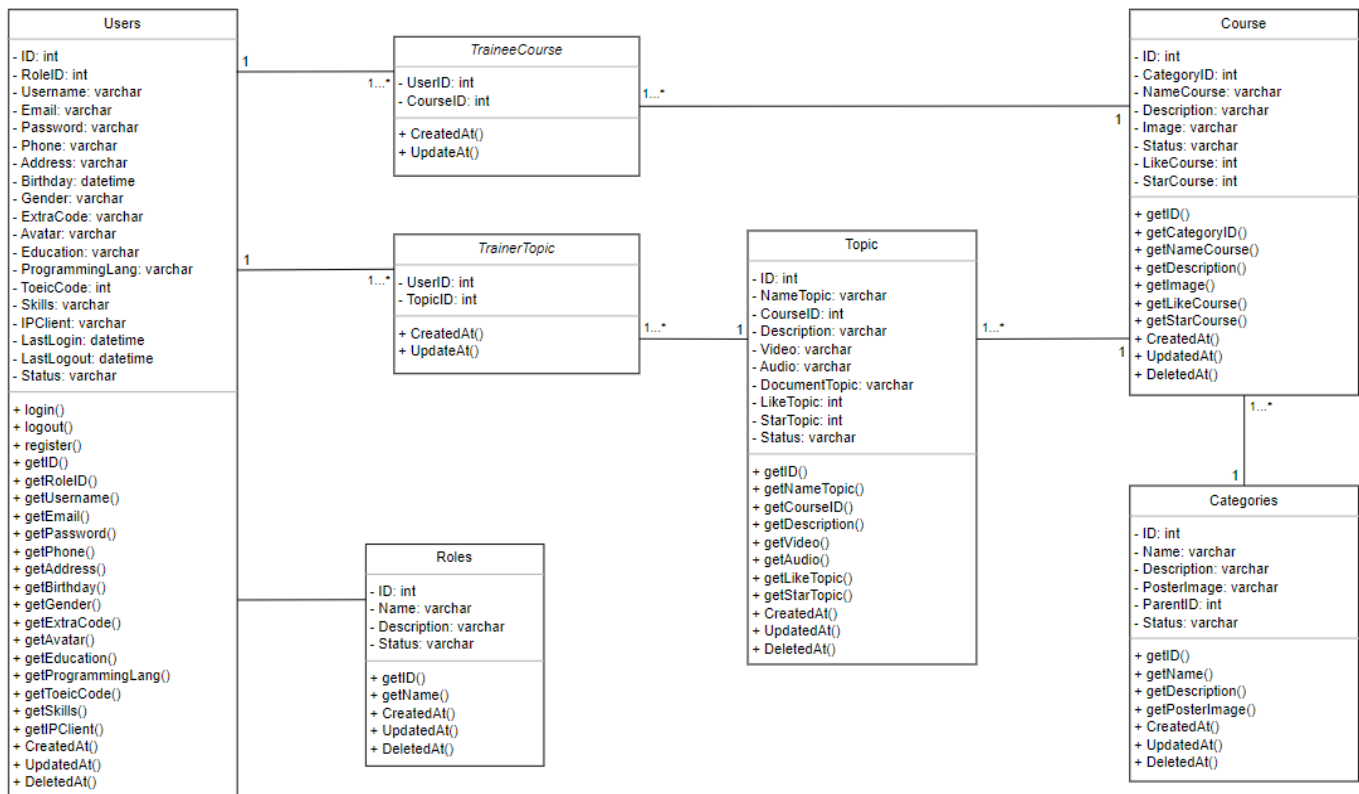


Figure 6: UML

Training staff account management process:

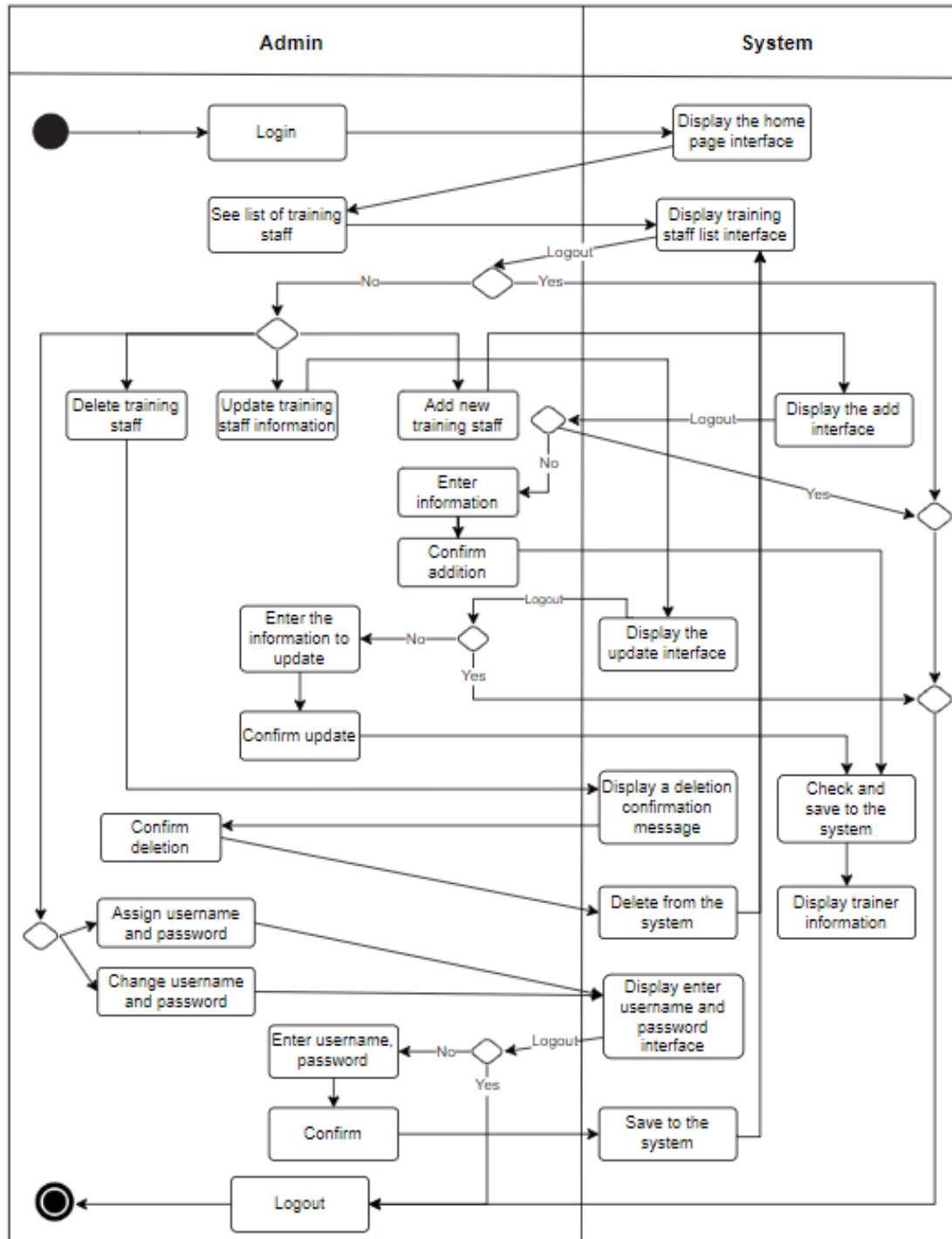


Figure 8: Training staff account management process

Trainee account management process:

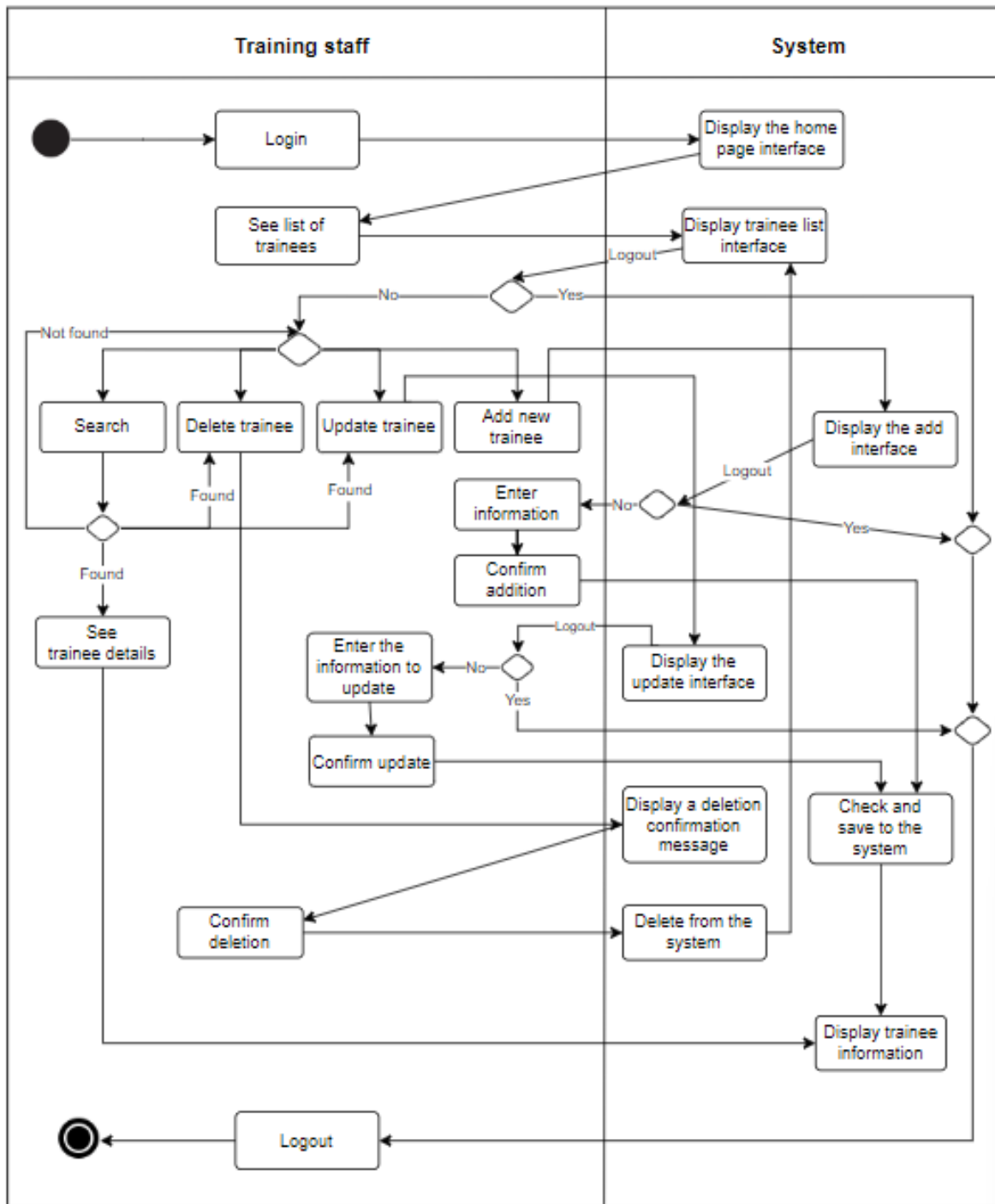


Figure 9: Trainee account management process

Category management process:

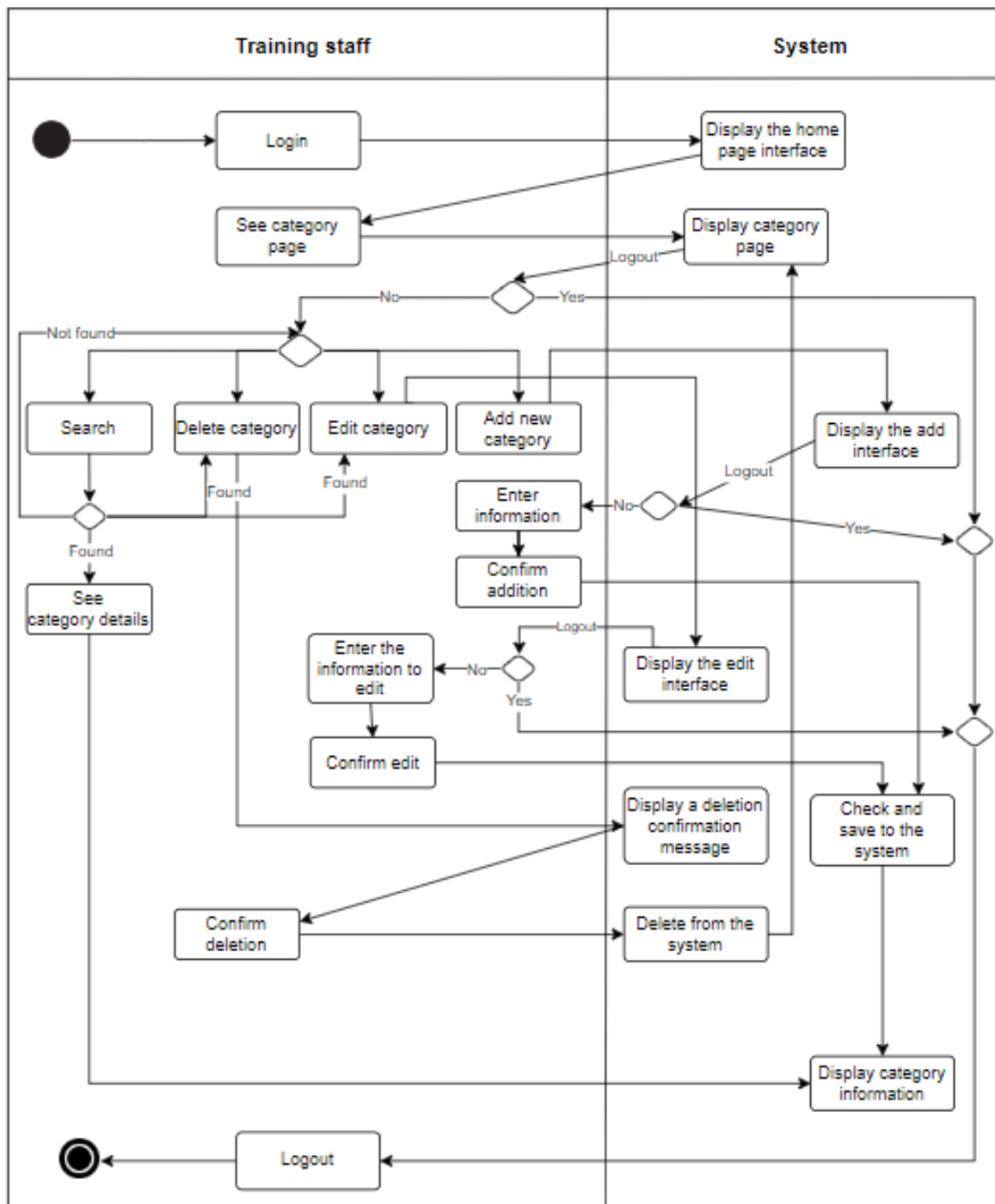


Figure 10: Category management process

Course management process:

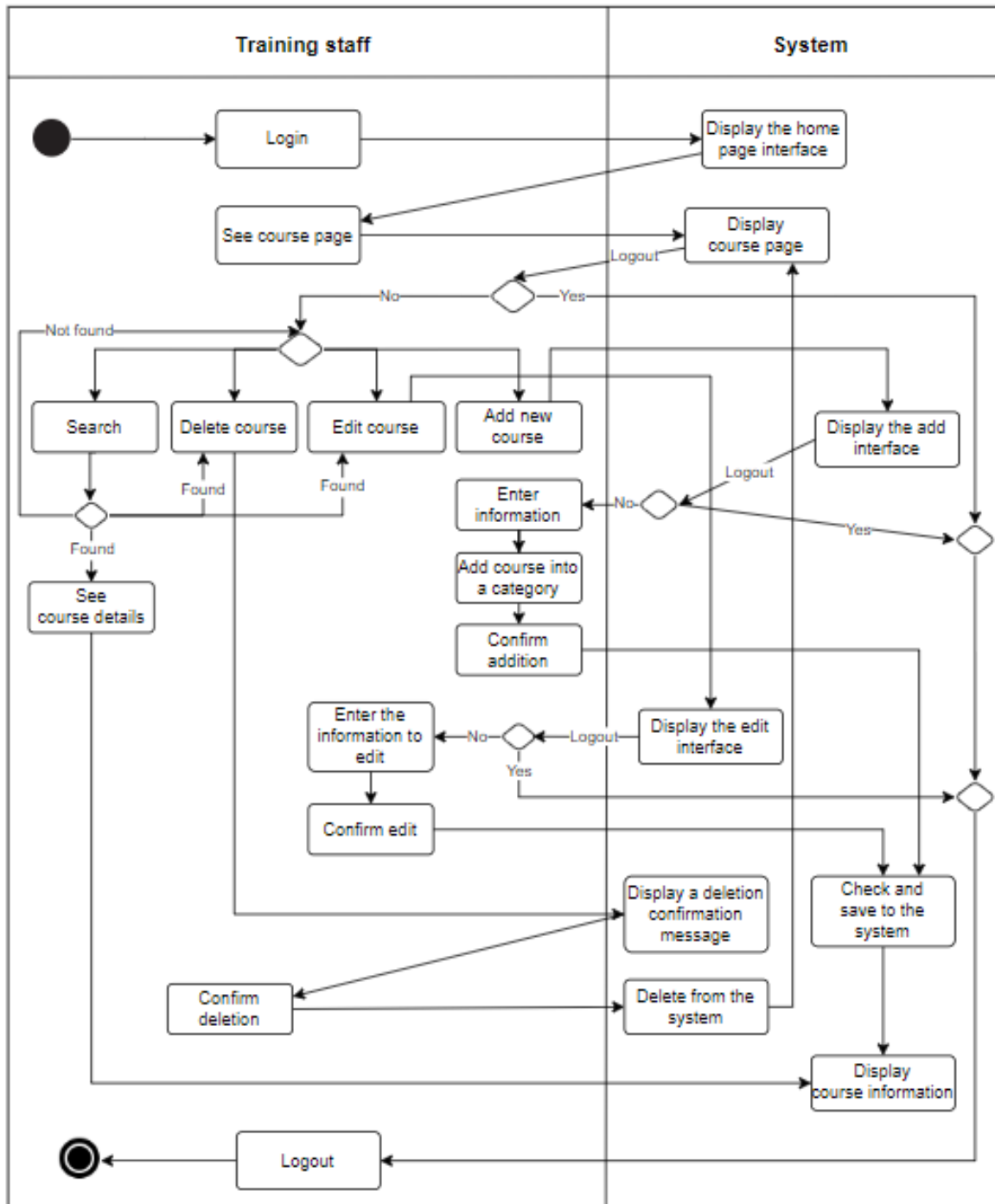


Figure 11: Course management process

Topic management process:

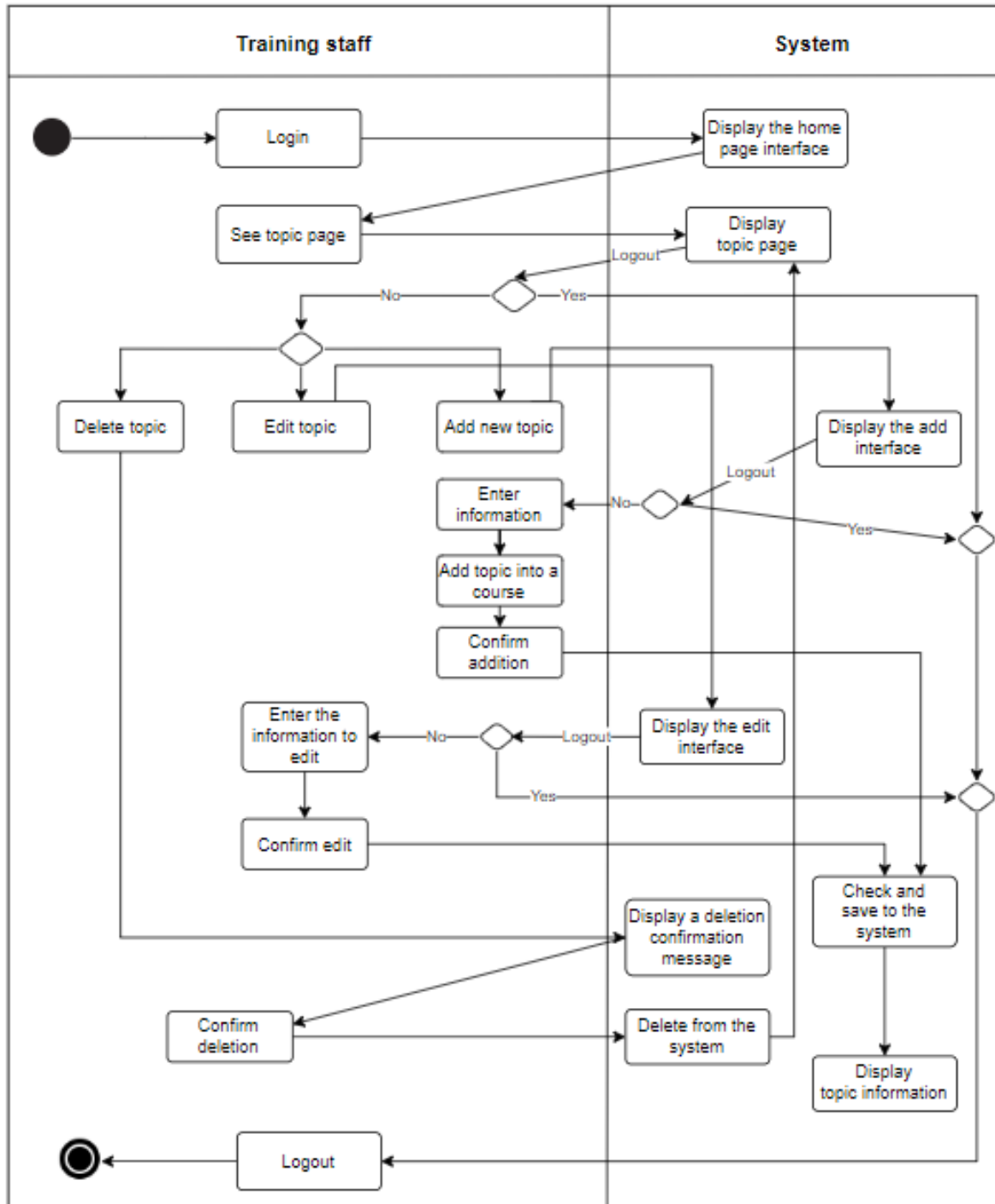


Figure 12: Topic management process

2.4. Assumptions and Dependencies

2.4.1. Assumptions

Assumptions play a crucial role in the planning and execution of any project. Here are some assumptions that could be made for the project of developing a "Training" activity management system for FPT company:

Employee Resistance to Change: There might be resistance among employees to adopt a new training management system, especially if they are accustomed to existing processes or tools. This resistance could influence the requirements for user interface design, training and support resources, and change management strategies.

Budget Constraints: Assumptions about the budget allocated for the project could impact the scope and features of the training management system. Limited resources may necessitate prioritization of certain functionalities over others.

Technology Compatibility: Assumptions regarding the existing technology infrastructure within the organization could affect the technical requirements for the training management system. Compatibility with legacy systems or integration with other software tools may need to be considered.

Organizational Culture: The organizational culture, including attitudes towards technology adoption, collaboration, and communication, could influence the requirements for the system. For example, if the company values decentralized decision-making, the system may need to accommodate multiple stakeholders with varying levels of authority.

Data Privacy and Security Concerns: Assumptions about data privacy regulations and security requirements could impact the design and implementation of the system. Compliance with industry standards or legal frameworks may influence features such as user authentication, data encryption, and access controls.

Scalability and Growth: Assumptions about the future growth and scalability of the organization could influence the requirements for the system. The system may need to be scalable to accommodate an increasing number of users, training activities, and organizational changes over time.

Stakeholder Expectations: Assumptions about the expectations and preferences of key stakeholders, such as HR managers, trainers, and employees, could impact the requirements for the system. Gathering input from stakeholders and managing their expectations throughout the project lifecycle is crucial for success.

External Events or Disruptions: Assumptions about external events or disruptions, such as changes in market conditions, regulatory requirements, or technological advancements, could impact the requirements for the system. The system may need to be adaptable and resilient.

2.4.2. Dependencies

When developing a "Training" activity management system for a company's internal training program, there might be dependencies on external factors. Some of these dependencies could include:

Third-Party Libraries or Frameworks: If the project plans to utilize third-party libraries or frameworks for specific functionalities such as user authentication, data visualization, or reporting, there might be dependencies on the availability, compatibility, and licensing terms of these components.

APIs and Integration Points: The training management system may need to integrate with existing systems or external services for functionalities such as management or reporting. Dependencies on the stability and accessibility of these APIs or integration points need to be considered.

Data Sources and Data Feeds: The system may rely on data from external sources or feeds, such as employee records, training content repositories, or performance metrics. Dependencies on the availability, accuracy, and consistency of these data sources need to be addressed.

Infrastructure and Hosting Services: Dependencies on external infrastructure or hosting services, such as cloud platforms or data centers, may exist for hosting the application, databases, or other components of the system. Considerations include reliability, scalability, and performance of these services.

Regulatory Compliance and Standards: The project may have dependencies on compliance with industry standards, regulations, or legal requirements, such as data privacy regulations (e.g., GDPR) or accessibility standards (e.g., WCAG). Adherence to these standards may impact the design and implementation of the system.

Internal Policies and Procedures: Dependencies on internal policies, procedures, and guidelines within the organization, such as IT security policies, change management processes, or procurement policies, need to be considered when developing the system.

3. OTHER NON-FUNCTIONAL REQUIREMENTS (P2)

3.1. Performance Requirements

Performance requirements for a system managing the activity of "Training" within a company's internal training program are crucial for ensuring efficient operation and user satisfaction. Below are some specific performance requirements along with their rationale:

Responsiveness:

- Requirement: The system should respond to user interactions within 2 seconds under normal load conditions.
- Rationale: Quick response times enhance user experience and productivity. Users expect prompt feedback when interacting with the system to perform tasks efficiently.

Scalability:

- Requirement: The system should support a minimum of 100 simultaneous users without performance degradation.
- Rationale: As the number of users increases, the system should be able to handle the load seamlessly without compromising performance. This ensures smooth operation during peak usage times.

Reliability:

- Requirement: The system should have an uptime of 99.9%.
- Rationale: High reliability ensures that the system is available for users when needed, minimizing downtime and disruptions to training activities. It fosters trust among users and stakeholders.

Security:

- Requirement: The system should be able to handle authentication and authorization processes.
- Rationale: Quick authentication and authorization processes ensure that only authorized users gain access to sensitive training materials and functionalities, enhancing security and protecting confidential information.

Real-time Updates:

- Requirement: The system should update information in real-time.
- Rationale: Real-time updates provide users and administrators with accurate and up-to-date information on training progress, enabling timely decision-making and monitoring of performance.

Backup and Recovery:

- Requirement: System backups should be completed daily, and data recovery should be achievable in case of system failure.
- Rationale: Regular backups and swift data recovery procedures minimize the risk of data loss and ensure business continuity in the event of system failures or disasters.

3.2. Safety and Security Requirements

Safety and security requirements for a system managing the activity of "Training" within a company's internal program are critical to protect against potential risks, ensure data integrity, and maintain user privacy. Here are specific requirements:

Data Privacy Compliance:

- Requirement: The system must comply with relevant data privacy regulations such as GDPR or any other applicable laws.
- Safeguard: Implement data encryption mechanisms to protect sensitive information such as employee personal data and training records.
- Rationale: Ensures that user data is handled responsibly, minimizing the risk of unauthorized access or data breaches.

Access Control:

- Requirement: Access to training materials and user data must be role-based and restricted to authorized personnel only.
- Safeguard: Implement robust authentication mechanisms (e.g., username/password, multi-factor authentication) to verify user identity.
- Rationale: Prevents unauthorized access to sensitive information, protecting both user privacy and company assets.

User Authentication:

- Requirement: Users must authenticate themselves before accessing the system or any training-related data.
- Safeguard: Enforce strong password policies and session management to prevent unauthorized access.
- Rationale: Ensures that only authenticated users have access to the system, reducing the risk of unauthorized use or data tampering.

Data Backup and Recovery:

- Requirement: Regular automated backups of training data must be performed, with offsite storage for disaster recovery purposes.
- Safeguard: Implement automated backup routines and periodically test data restoration procedures to ensure data integrity.
- Rationale: Mitigates the risk of data loss due to hardware failures, cyberattacks, or other unforeseen events, minimizing downtime and potential harm to business operations.

Security Compliance Certifications:

- Requirement: The system must obtain relevant security certifications (e.g., ISO 27001) to demonstrate compliance with industry standards.
- Safeguard: Ensure that security controls and practices align with certification requirements, undergoing regular audits and assessments.
- Rationale: Enhances trust and confidence in the system's security posture, especially for clients or stakeholders with strict security requirements.

Data Integrity Checks:

- Requirement: Implement mechanisms to verify the integrity of training data, detecting and preventing unauthorized modifications or tampering.
- Safeguard: Utilize checksums, digital signatures, or cryptographic hashing techniques to detect data alterations.
- Rationale: Ensures the accuracy and reliability of training data, reducing the risk of misinformation or errors in decision-making processes.

Training Content Security:

- Requirement: Ensure that training materials are free from malware or malicious content.
- Safeguard: Implement content scanning and validation procedures to detect and remove any potentially harmful content.
- Rationale: Protects users from security threats such as malware infections or phishing attacks that may be embedded within training materials.

By incorporating these safety and security requirements into the system design and development process, the company can mitigate risks, safeguard sensitive information, and maintain compliance with relevant regulations and standards, thereby fostering a secure and trustworthy training environment for employees.

3.3. Software Quality Attributes

The quality attributes of a company's internal operations management software are the characteristics that the software should have to ensure performance, reliability, and flexibility in the internal operations management process. Here are some important quality attributes for our project:

Usability: The system should be intuitive and easy to navigate for users of varying technical backgrounds. Clear interfaces, straightforward workflows, and user-friendly features will enhance overall usability. So need to achieve a minimum score of 85% on user satisfaction surveys conducted, based on responses regarding ease of navigation, clarity of interfaces, and intuitiveness of workflows.

Flexibility: The system should be flexible enough to accommodate various types of training activities, content formats, and scheduling requirements. This flexibility ensures that the system can adapt to the evolving needs of the organization's training program.

Interoperability: Integration capabilities with existing systems or tools used by the company for HR management, employee databases, or learning management systems (LMS) will be important. So need to ensure seamless integration with existing HR systems and learning management systems, with a documented success rate of 99% for data exchange between systems based on performance reports.

Maintainability: The system should be designed with maintainability in mind, including well-structured code, documentation, and modular architecture. This ensures that future updates, enhancements, and bug fixes can be implemented efficiently without disrupting ongoing operations. So need to maintain an average code complexity score below 20 (as measured

by cyclomatic complexity) across all modules, and ensure that documentation covers at least 90% of the codebase, verified through regular code reviews and audits.

Reliability: Users rely on the system to access critical training resources and information. Therefore, it's essential that the system operates reliably without frequent downtime or errors. It needs to achieve a system uptime of 99.9% over the course of a year, with no more than 0.1% of user transactions resulting in errors or system failures.

Testability: Maintain test coverage of at least 85% for all system components, measured through automated testing tools and verified through regular regression testing during each development cycle.

Availability: Ensure that the system is available 24/7, with scheduled downtime limited to no more than 1 hour per month for maintenance purposes, and achieve a mean time to recovery (MTTR) of less than 15 minutes for unplanned outages. This requires reliable hosting infrastructure, disaster recovery plans, and proactive monitoring to minimize downtime and ensure continuous availability.

Adaptability: Implement at least 80% of requested feature enhancements, based on prioritization by stakeholders and tracked through sprint retrospectives and feature completion reports. Regular updates and enhancements will help keep the system aligned with the company's goals and objectives.

Portability: Ensure that the system can be deployed on both on-premises servers and cloud platforms, with documented deployment scripts and configurations available, and achieve a deployment success rate of 95% across different environments, verified through deployment logs and post-deployment checks.

Reusability: Design the components or modules in the system in a reusable manner and ensure that reusable components are used in at least 70% of the new feature implementation to enable enhancements. Increase development efficiency and reduce duplication of effort.

3.4. Risk Assessment

Conducting a risk assessment for a project to develop an internal training management system for a company is very important to ensure that the project can be implemented effectively and without major problems. Therefore, in this section I will present some common project risks and related management measures:

Lack of support from end users:

- Risk: End users refuse to accept the new system, making it difficult to deploy and use.
- Solution: Ensure end-user support and involvement from design to implementation. Organize training sessions and facilitate early feedback from their side.

Lack of resources or skills:

- Risk: Lack of resources or skills needed to develop and deploy the system.
- Solution: Assess and identify the skills and resources needed from the early stages of the project. Consider hiring or training staff, or using an outside service if needed.

Lack of uniformity in project requirements:

- Risk: Project requirements are not clearly defined or change constantly, leading to ambiguity during development.
- Solution: Establish and maintain a process to identify and manage project requirements. Regularly interact with customers and users to identify and agree on requirements.

Technical problems or software errors:

- Risk: Technical problems or software errors cause interruptions during deployment and use.
- Solution: Perform thorough technical testing and error checking before deployment. Establish an effective error management process to track, report, and fix errors that arise.

Information security issues:

- Risk: Important or sensitive data could be stolen or leaked.
- Solution: Implement information security measures such as data encryption, periodic checks and software updates, as well as train employees on information security rules.

4. SPECIFIC REQUIREMENTS (M1)

4.1. External Interface Requirements

4.1.1. User Interfaces

In this section, I will proceed to characterize the logic of each interface between the software product and the user and a basic description of how the user will interact with the system. User interface This training management system will provide a web interface for different roles: administrator, trainer, training staff, trainee. Depending on each role, users are authorized to perform different actions:

Login Interface:

- Logic Characteristics: This interface facilitates user authentication into the system. It verifies user credentials (such as username and password) to grant access securely.
- Interaction: Users provide their login credentials through designated fields. Upon successful authentication, they gain access to the system's features.

Trainee Management Interface:

- Logic Characteristics: This interface enables administrators to manage trainee profiles. It allows actions such as adding new trainees, editing existing profiles, and deleting outdated or duplicate entries.
- Interaction: Users navigate to the trainee management section where they can perform actions like adding new trainees by filling out forms, editing profiles by selecting and modifying details, or deleting profiles with confirmation prompts. In addition, users can also search and view detailed information of each academy.

Trainer Management Interface:

- Logic Characteristics: Similar to trainee management, this interface is used to manage trainer profiles. It facilitates tasks such as adding new trainers, updating information, and removing trainers as necessary.
- Interaction: Users access the trainer management section to add new trainers by providing relevant information, edit existing profiles, or remove trainers with confirmation steps.

Training Staff Management Interface:

- Logic Characteristics: This interface allows administrators to manage training staff. It includes functionalities for adding, editing, and deleting.
- Interaction: Users utilize this interface to manage training staff accounts by adding new members, modifying existing profiles, adjusting roles and permissions, and removing staff members when needed.

Category Management Interface:

- Logic Characteristics: Category management enables administrators to organize training activities into logical groups. It supports tasks like creating new categories, editing category details, and removing obsolete categories.
- Interaction: Users interact with this interface to create new categories by specifying names, descriptions and other information, edit existing categories by selecting and modifying details, or delete categories with confirmation prompts. In addition, users can also search the category by entering the name in the search box.

Course Management Interface:

- Logic Characteristics: This interface facilitates the creation, modification, and deletion of training courses. It allows administrators to specify course details, associate courses with relevant categories, and manage course content.
- Interaction: Users access the course management section to add new courses by providing details like names, descriptions, and associated categories,..., edit existing courses by selecting and updating information, or delete courses with confirmation steps. In addition, users can also search the course by entering the name in the search box.

Topic Management Interface:

- Logic Characteristics: Topic management focuses on the creation and organization of topics within courses. It supports actions such as adding new topics, editing topic details, and removing topics when they are no longer relevant.
- Interaction: Users interact with this interface to add topics by specifying names, descriptions and other information, edit existing topics by selecting and modifying details, or delete topics with confirmation prompts.

About User interaction description:

Administrators: They will have access to all management interfaces and will be responsible for overseeing the entire training activity management system. They will interact with these interfaces to add, edit, and delete users, categories, courses, and topics as needed.

Trainers and Training Staff: They will have limited access to certain management interfaces, mainly related to their roles. Trainers may interact with the trainer management interface to update their information. Training staff may use the staff management interface to manage their tasks and responsibilities. They can manage trainee accounts, categories, courses and topics.

Trainees: Trainees will primarily interact with the system through the trainee management interface to update their personal information and training preferences. They will also interact with the course management interface to enroll in courses and track their progress.

Below are some of the looks we've done. However, these interfaces are just basic interfaces and we are still in the process of designing, editing and improving. The interfaces we provide here will include: Login, Dashboard, Category management, Course management, Topic management:

Login:

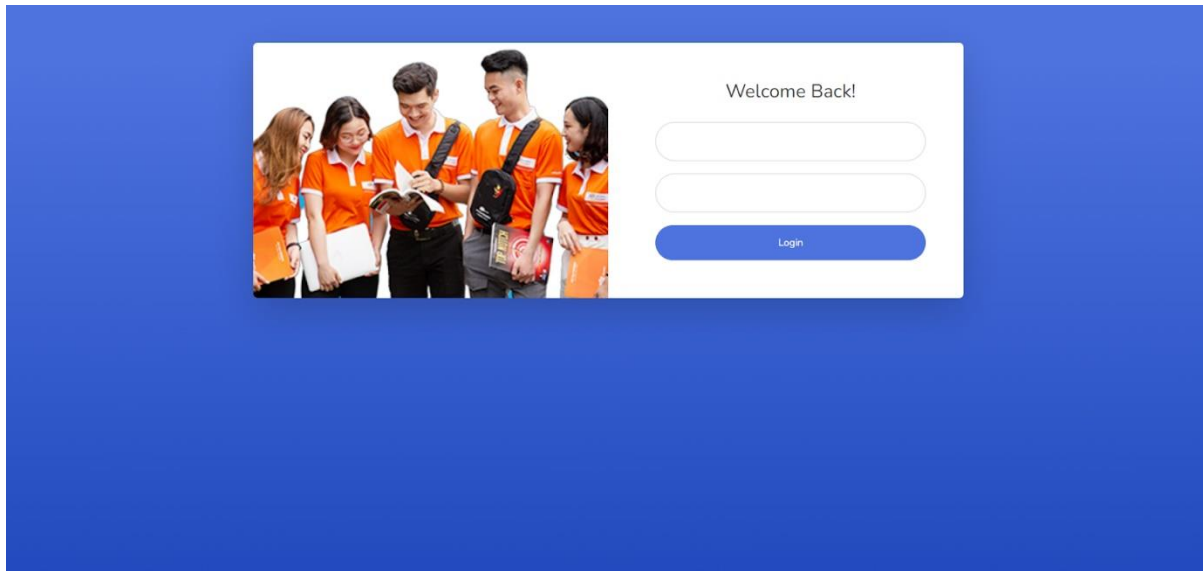


Figure 13: Login

Dashboard:

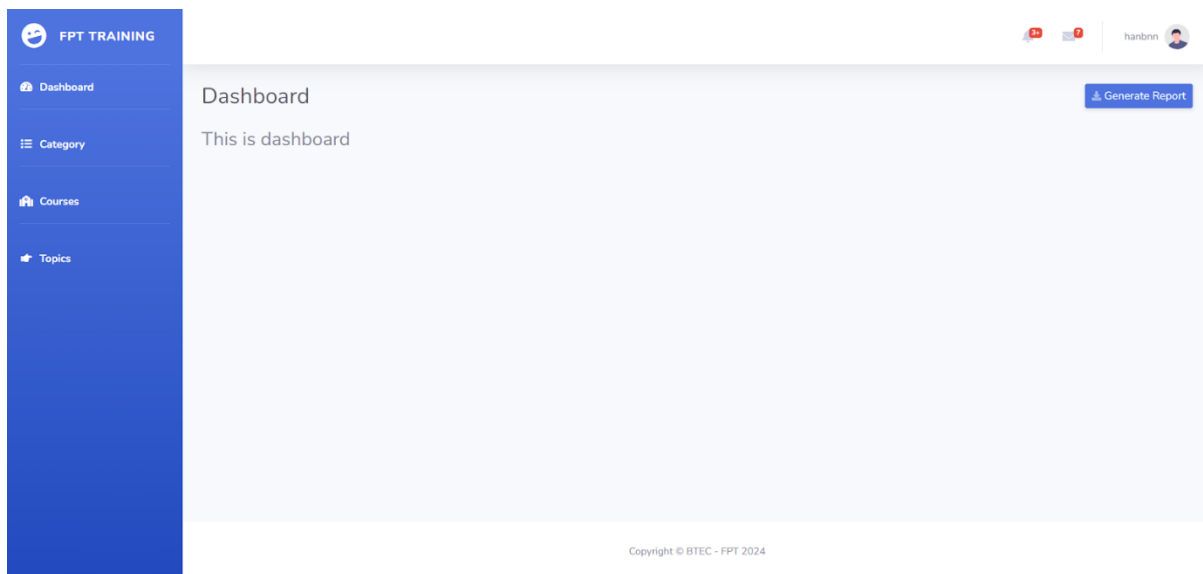


Figure 14: Dashboard

Category page:

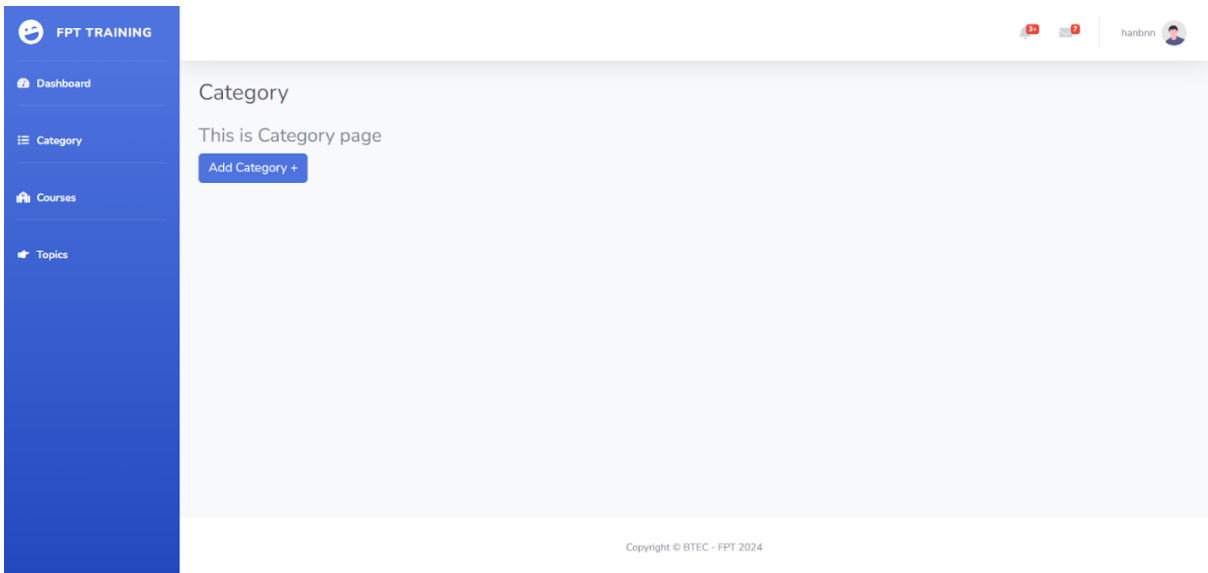


Figure 15: Category page

Course page:

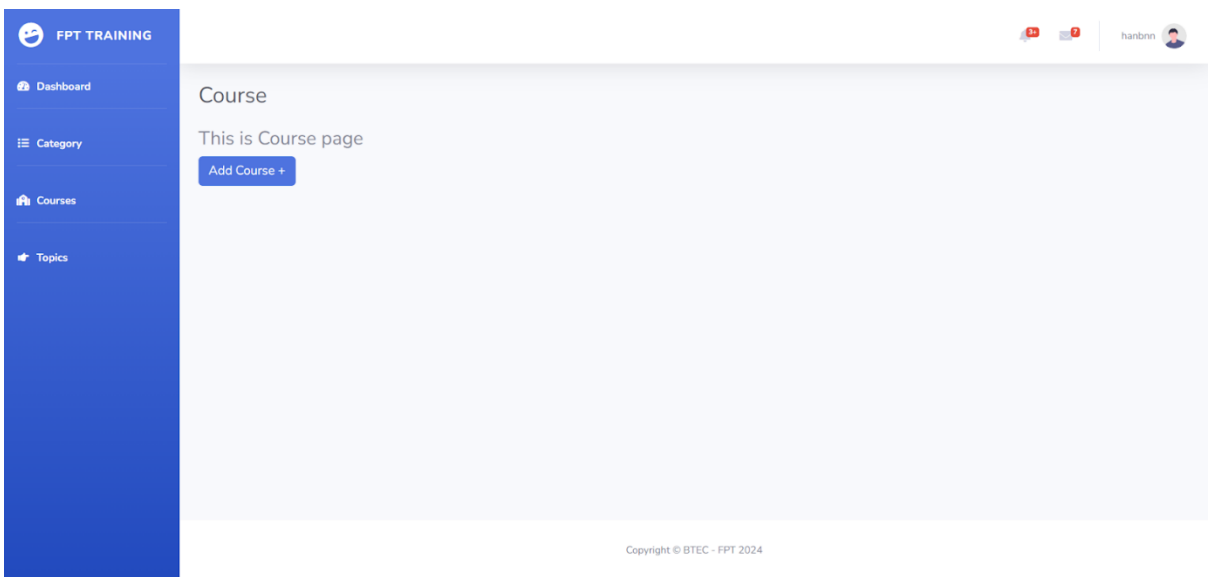


Figure 16: Course page

Topic page:

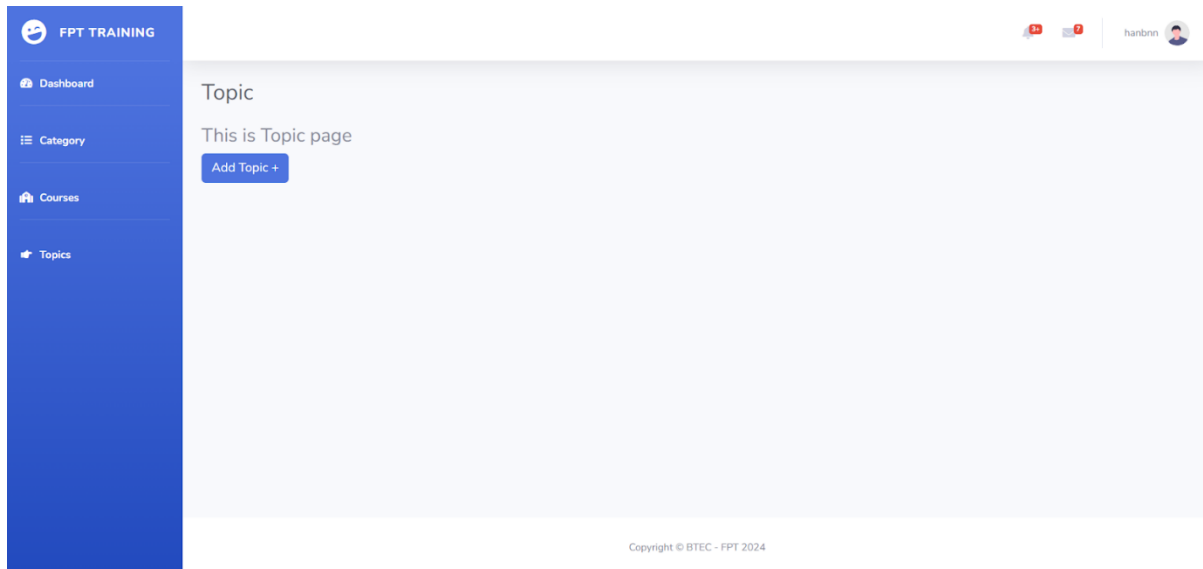


Figure 17: Topic page

4.1.2. Hardware Interfaces

The hardware interfaces play crucial roles in enabling communication and interaction between the software product and the underlying hardware components of the system. They ensure seamless integration, efficient data exchange, and optimal utilization of hardware resources to deliver the desired functionality and performance. Here are the logical and physical characteristics of each interface between the software product and the hardware components of the system for the "Training" activity management system:

Database Interface:

- Logical Characteristics: This interface allows the software to interact with the database management system (DBMS) to store, retrieve, and manipulate data related to users, courses, training activities, etc.
- Physical Characteristics: It consists of communication protocols, query languages, and data transfer mechanisms. The physical connection can be via network protocols such as TCP/IP or local connections if the DBMS is hosted on the same server as the software.

User Interface (UI):

- Logical Characteristics: The UI allows users to interact with the software product, providing input and receiving output. It includes forms, menus, buttons, and other graphical elements.
- Physical Characteristics: The UI is typically displayed on a computer monitor or mobile device screen. It relies on input devices like keyboards, mice, touchscreens, etc., and output devices such as monitors or speakers.

Network Interface:

- Logical Characteristics: This interface enables communication between different components of the system over a network, facilitating data exchange and system integration.
- Physical Characteristics: It involves network hardware such as routers, switches, cables, and wireless access points. The physical connection can be wired (e.g., Ethernet) or wireless (e.g., Wi-Fi), depending on the network infrastructure.

API (Application Programming Interface):

- Logical Characteristics: APIs define how software components can interact with each other, allowing seamless integration between different modules or systems.
- Physical Characteristics: APIs can be implemented using various protocols and technologies such as RESTful APIs over HTTP, SOAP web services, or messaging protocols like MQTT. The physical connection occurs through network communication between the software components.

Peripheral Interface:

- Logical Characteristics: This interface defines logical protocols and data formats for communication between the software system and peripheral devices such as printers, scanners, sensors, or actuators.
- Physical Characteristics: Physically, the peripheral interface involves physical connections like USB, Bluetooth, serial ports, or network interfaces. It requires device drivers, protocols, and APIs to facilitate communication and data exchange between the software and peripheral devices.

Operating System Interface:

- Logical Characteristics: This interface allows the software to interact with the underlying operating system (OS), accessing system resources such as files, memory, and hardware devices.
- Physical Characteristics: It involves system calls and libraries provided by the OS for managing hardware resources and performing system-level operations. The physical connection occurs at the OS level, abstracted from the software application.

4.1.3. Software Interfaces

In the context of developing a "Training" activity management system for FPT company's internal training program, the software product may need to interact with various other software components to achieve its functionality. These connections between the training management system and these specific software components enhance its functionality, improve user experience, and optimize the overall training program management process for the FPT company. Here are some software components and their connections to our system:

User Authentication System: The training management system may integrate with the company's user authentication system to verify user identities and manage access control. This connection allows users to log in to the training system using their existing company credentials, enhancing security and streamlining user management.

Learning Management System (LMS): The training management system might integrate with an existing Learning Management System (LMS) used by the company to deliver online courses, track learner progress, and manage training content. This integration enables seamless sharing of course materials, enrollment data, and training schedules between the training management system and the LMS, providing a unified learning experience for users.

Content Management System (CMS): The training management system may integrate with a Content Management System (CMS) to manage and deliver training content such as documents, videos, presentations, and interactive modules. This integration allows administrators to upload, organize, and update training materials directly within the CMS and seamlessly deliver them to users through the training management system's interface.

Communication and Collaboration Tools: The training management system might connect with communication and collaboration tools such as email clients, messaging platforms... Integrating with these tools enables administrators to communicate training announcements, reminders, and updates to users effectively. It also facilitates real-time collaboration among trainers, trainees, and training staff during virtual sessions or group discussions.

Calendar and Scheduling Applications: The training management system may connect with calendar and scheduling applications to coordinate training sessions, reserve training facilities, and manage trainer availability. Integrating with these applications streamlines the scheduling process, reduces conflicts, and ensures that training sessions are scheduled efficiently. Users can also receive automated notifications and reminders about upcoming training events through their calendars.

Analytics and Reporting Tools: The training management system could integrate with analytics and reporting tools to analyze training data, track learner engagement, and generate performance reports. This integration allows administrators to gain insights into training effectiveness, identify trends, and make data-driven decisions to optimize the training program. It also enables them to generate customizable reports for stakeholders and regulatory compliance purposes.

4.2. Functional Requirements

In this section, I will once again reiterate the functional requirements of the project of developing a "Training" activity management system for the FPT company's internal training program. Together these functional requirements will provide a comprehensive solution for managing various aspects of training activities within the organization. It include:

Login:

- Users authenticate themselves using a username and password to access the system.
- Upon successful authentication, users are granted appropriate access rights and privileges based on their roles.
- The login function ensures security and controls user access to sensitive training data and functionalities.

Trainee Account Management:

- Administrators can add, edit, or delete trainee accounts in the system.
- They can assign or change usernames and passwords for trainees.
- The function also includes search capabilities to find specific trainee accounts efficiently.

Trainer Management:

- Administrators have the ability to add, edit, or delete trainer accounts in the system.
- They can assign or change usernames and passwords for trainers.
- Trainer management ensures that qualified individuals are available to conduct training sessions.

Category Management:

- Allows administrators to manage categories used to classify training courses.
- Administrators can add, edit, or delete categories as needed.
- Category management helps organize and classify training courses for easy navigation and search.

Course Management:

- Provides tools for administrators to manage individual training courses within the system.
- Administrators can add, edit, or delete courses, as well as search for specific courses.
- Course management facilitates effective planning, scheduling, and tracking of training activities.

Topic Management:

- Allows administrators to manage common topics used in various training courses.
- Includes functionalities to add, edit, or delete topics, as well as organize them into categories.
- Topic management ensures consistency and relevance in course content across different training programs.

Assign Topics to Courses:

- Enables administrators to assign specific topics to each course based on its content and objectives.
- Helps in categorizing and organizing courses, making it easier for users to find relevant training materials.

Assign Trainer to Topic:

- Allows administrators to assign trainers with expertise in specific topics to conduct related training sessions.
- Ensures that courses are delivered by qualified trainers with relevant knowledge and experience.

Assign Trainees to Courses:

- Allows administrators to assign trainees to specific courses based on their training needs and requirements.
- Helps in managing enrollment, tracking participation, and ensuring that trainees receive relevant training.

4.3. Use Case Model

4.3.1. Use Case 1: Login

USECASE 1: LOGIN		
Author	Group 4	
Purpose	The basic objective of this use case is to authenticate users when interacting with the system, ensuring that only authorized users are granted access and provided with the appropriate rights and scope of access to the system.	
Requirements Traceability	This usecase is traced to the requirement "Login" in the system's functional requirements.	
Preconditions	<ul style="list-style-type: none"> - The system is running and accessible. - Users have been registered and have valid credentials (username and password) to login. 	
Post conditions	<ul style="list-style-type: none"> - Upon successful authentication, the user gains access to the system and is directed to the dashboard. - If authentication fails, the user receives an error message indicating invalid credentials and is prompted to retry. 	
Actors	User: Initiates the login process by providing credentials (username and password).	
Flow of Events	1. Basic Flow	
	Performed by	Action
	1. User	The user navigates to the login page of the system.
	2. System	The system prompts the user to enter their username and password.
	3. User	The user enters their credentials.
	4. System	The system validates the credentials against the stored user database.
	5. System	If the credentials are valid: <ul style="list-style-type: none"> - The system grants access to the user. - The user is directed to the dashboard.

	2. Alternative Flow	
	Performed by	Action
	5a. System	If the credentials are invalid: <ul style="list-style-type: none"> - The system displays an error message indicating invalid credentials. - The user is prompted to retry the login process.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters technical issues (e.g., database connection failure), an error message is displayed, and the user is prompted to try again later.
Notes	<ul style="list-style-type: none"> - It's essential to ensure that the login process is secure to prevent unauthorized access to the system. - Consider implementing additional security measures such as two-factor authentication for enhanced security. 	

Table 3: Usecase 1 – Login

4.3.2. Use Case 2: Trainer Management

USECASE 2: TRAINER MANAGEMENT		
Author	Group 4	
Purpose	The purpose of this use case is to provide administrators with the ability to manage trainer accounts within the training management system. This includes adding, editing, and deleting trainer information, as well as assigning and changing usernames and passwords for trainers.	
Requirements Traceability	This use case is traced to the requirement "Trainer Management" in the system's functional requirements.	
Preconditions	<ul style="list-style-type: none">- The system is running and accessible.- The user has appropriate administrative privileges to access the trainer management functionality.	
Post conditions	Upon successful execution of the use case: <ul style="list-style-type: none">- New trainer accounts are added or existing ones are updated or removed as per the administrator's actions.- Trainer information and credentials are updated accordingly in the system.	
Actors	Administrator/Training staff: Initiates the trainer management process by accessing the administrative interface of the system.	
Flow of Events		
Add new account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainer management section within the administrative interface.
	2. System	The system presents a list of existing trainers along with options to add, edit, or delete trainers.
	3. Administrator	The administrator selects the option to add a new trainer.

	4. System	The system prompts the administrator to enter the necessary information for the new trainer.
	5. Administrator	The administrator provides the required information and confirms the addition of the new trainer.
	6. System	The system checks and confirms additional success.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while adding trainer accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Edit account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainer management section within the administrative interface.
	2. System	The system presents a list of existing trainers along with options to add, edit, or delete trainers.
	3. Administrator	The administrator selects the option to edit an existing trainer.

	4. System	The system displays a form with pre-filled information for the selected trainer.
	5. Administrator	The administrator updates the trainer's information
	6. System	The system checks and confirms successful editing
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while editing trainer accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Delete account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainer management section within the administrative interface.
	2. System	The system presents a list of existing trainers along with options to add, edit, or delete trainers.
	3. Administrator	The administrator selects the option to delete an existing trainer.

	4. System	The system presents a confirmation prompt to ensure the administrator's intention to delete the trainer.
	5. Administrator	The administrator confirms the deletion, and the trainer account is removed from the system.
	6. System	The system confirms successful deleting
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message when deleting the account - The user is prompted to check and redo the deletion action.
	3. Exceptions	
Assign/Change username or password	Performed by	Action
	System	If the system encounters errors while deleting trainer accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainer management section within the administrative interface.
	2. System	The system presents a list of existing trainers along with options to add, edit, or delete trainers.
	3. Administrator	The administrator selects the option to specify or change the username and password.

	4. System	The system provides fields to enter or update the username and password for the selected trainer.
	5. Administrator	The administrator enters or updates the credentials and confirms the changes.
	6. System	The system checks and confirms successful.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are prompted to check and re-enter information.
Notes	<ul style="list-style-type: none"> - Ensure that only authorized administrators have access to the trainer management functionality to maintain data security and integrity. - Implement validation checks to ensure that only valid data is entered or updated for trainer accounts. 	

Table 4: Usecase 2 - Trainer management

4.3.3. Use Case 3: Trainee Management

USECASE 3: TRAINEE MANAGEMENT		
Author	Group 4	
Purpose	The purpose of this use case is to allow administrators to manage trainee accounts within the training management system. This includes adding, editing, and deleting trainee information, as well as viewing trainee account details and searching for specific trainee accounts.	
Requirements Traceability	This use case is traced to the requirement "Trainee Management" in the system's functional requirements.	
Preconditions	<ul style="list-style-type: none">- The system is running and accessible.- The user has appropriate administrative privileges to access the trainee management functionality.	
Post conditions	<p>Upon successful execution of the use case:</p> <ul style="list-style-type: none">- New trainee accounts are added or existing ones are updated or removed as per the administrator's actions.- Trainee information is updated accordingly in the system.	
Actors	Administrator: Initiates the trainee management process by accessing the administrative interface of the system.	
Flow of Events		
Add new account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainee management section within the administrative interface.
	2. System	The system presents a list of existing trainees along with options to add, edit, or delete trainees.
	3. Administrator	The administrator selects the option to add a new trainee.
	4. System	The system prompts the administrator to enter the necessary information for the new trainee.

	5. Administrator	The administrator provides the required information and confirms the addition of the new trainee.
	6. System	The system checks and confirms additional success.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while adding trainee accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Edit account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainee management section within the administrative interface.
	2. System	The system presents a list of existing trainees along with options to add, edit, or delete trainees.
	3. Administrator	The administrator selects the option to edit an existing trainee.
	4. System	The system displays a form with pre-filled information for the selected trainee.

	5. Administrator	The administrator updates the trainee's information
	6. System	The system checks and confirms successful editing
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while editing trainee accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Delete account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainee management section within the administrative interface.
	2. System	The system presents a list of existing trainees along with options to add, edit, or delete trainees.
	3. Administrator	The administrator selects the option to delete an existing trainee.
	4. System	The system presents a confirmation prompt to ensure the administrator's intention to delete the trainee.

	5. Administrator	The administrator confirms the deletion, and the trainee account is removed from the system.
	6. System	The system confirms successful deleting
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message when deleting the account - The user is prompted to check and redo the deletion action.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while deleting trainee accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
View trainee account detail	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainee management section within the administrative interface.
	2. System	The system presents a list of existing trainees along with options to add, edit, or delete trainees.
	3. Administrator	The administrator selects a specific trainee from the list to view their account details.
	4. System	The system displays detailed information about the selected trainee, including their personal details, contact information,...

	2. Alternative Flow	
	Performed by	Action
	4a. System	The system does not display detailed information of the selected trainee account.
Search trainee account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the trainee management section within the administrative interface.
	2. System	The system presents a list of existing trainees along with options to add, edit, or delete trainees.
	3. Administrator	The administrator uses the search functionality provided by the system to search for a specific trainee account.
	4. System	The system filters the trainee list based on the search criteria entered by the administrator, displaying relevant results.
	2. Alternative Flow	
	Performed by	Action
	4a. System	The system does not display the searched trainee account.
Notes	<ul style="list-style-type: none"> - Ensure that only authorized administrators have access to the trainee management functionality to maintain data security and integrity. - Implement validation checks to ensure that only valid data is entered or updated for trainee accounts. 	

Table 5: Usecase 3 - Trainee management

4.3.4. Use Case 4: Training Staff Management

USECASE 4: TRAINING STAFF MANAGEMENT		
Author	Group 4	
Purpose	The purpose of this use case is to provide administrators with the ability to manage training staff accounts within the training management system. This includes adding, editing, and deleting trainer information, as well as assigning and changing usernames and passwords for trainers.	
Requirements Traceability	This use case is traced to the requirement "Training staff Management" in the system's functional requirements.	
Preconditions	<ul style="list-style-type: none">- The system is running and accessible.- The user has appropriate administrative privileges to access the trainer management functionality.	
Post conditions	Upon successful execution of the use case: <ul style="list-style-type: none">- New training staff accounts are added or existing ones are updated or removed as per the administrator's actions.	
Actors	Administrator: Initiates the training staff management process by accessing the administrative interface of the system.	
Flow of Events		
Add new account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the training staff management section within the administrative interface.
	2. System	The system presents a list of existing training staffs along with options to add, edit, or delete training staffs.
	3. Administrator	The administrator selects the option to add a new training staff.

	4. System	The system prompts the administrator to enter the necessary information for the new training staff.
	5. Administrator	The administrator provides the required information and confirms the addition of the new training.
	6. System	The system checks and confirms additional success.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while adding training staff accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Edit account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the training staff management section within the administrative interface.
	2. System	The system presents a list of existing training staffs along with options to add, edit, or delete training staffs.

	3. Administrator	The administrator selects the option to edit an existing training staff.
	4. System	The system displays a form with pre-filled information for the selected training staff.
	5. Administrator	The administrator updates the training staff's information
	6. System	The system checks and confirms successful editing
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while editing training staff accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Delete account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the training staff management section within the administrative interface.
	2. System	The system presents a list of existing training staffs along with options to add, edit, or delete training staffs.

	3. Administrator	The administrator selects the option to delete an existing training staff.
	4. System	The system presents a confirmation prompt to ensure the administrator's intention to delete the training staff.
	5. Administrator	The administrator confirms the deletion, and the training staff account is removed from the system.
	6. System	The system confirms successful deleting
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message when deleting the account - The user is prompted to check and redo the deletion action.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while deleting training staff accounts (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Assign/Change username or password	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the training staff management section within the administrative interface.
	2. System	The system presents a list of existing training staffs along with options to add, edit, or delete training staffs.

	3. Administrator	The administrator selects the option to specify or change the username and password.
	4. System	The system provides fields to enter or update the username and password for the selected training staff.
	5. Administrator	The administrator enters or updates the credentials and confirms the changes.
	6. System	The system checks and confirms successful.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are prompted to check and re-enter information.
Notes	<ul style="list-style-type: none"> - Ensure that only authorized administrators have access to the training staff management functionality to maintain data security and integrity. - Implement validation checks to ensure that only valid data is entered or updated for training staff accounts. 	

Table 6: Usecase 4 - Training staff management

4.3.5. Use Case 5: Category Management

USECASE 5: CATEGORY MANAGEMENT		
Author	Group 4	
Purpose	The purpose of this use case is to allow administrators to manage categories within the training management system. This includes adding, editing, and deleting categories, as well as searching for specific categories.	
Requirements Traceability	This use case is traced to the requirement "Category Management" in the system's functional requirements.	
Preconditions	<ul style="list-style-type: none">- The system is running and accessible.- The user has appropriate administrative privileges to access the category management functionality.	
Post conditions	Upon successful execution of the use case: <ul style="list-style-type: none">- New categories are added or existing ones are updated or removed as per the administrator's actions.- The system reflects the changes in the category structure.	
Actors	Administrator: Initiates the category management process by accessing the administrative interface of the system.	
Flow of Events		
Add new account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the category management section within the administrative interface.
	2. System	The system presents a list of existing categories along with options to add, edit, or delete categories.
	3. Administrator	The administrator selects the option to add a new category.
	4. System	The system prompts the administrator to enter the necessary information for the new category, such as name and description.

	5. Administrator	The administrator provides the required information and confirms the addition of the new category.
	6. System	The system checks and confirms additional success.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while adding categories (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Edit account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the category management section within the administrative interface.
	2. System	The system presents a list of existing categories along with options to add, edit, or delete categories.
	3. Administrator	The administrator selects the option to edit an existing category.
	4. System	The system displays a form with pre-filled information for the selected category.

	5. Administrator	The administrator updates the category's information as needed and confirms the changes.
	6. System	The system checks and confirms successful editing
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while editing categories (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Delete account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the category management section within the administrative interface.
	2. System	The system presents a list of existing categories along with options to add, edit, or delete categories.
	3. Administrator	The administrator selects the option to delete an existing category.
	4. System	The system presents a confirmation prompt to ensure the administrator's intention to delete the category.

	5. Administrator	The administrator confirms the deletion, and the category is removed from the system.
	6. System	The system confirms successful deleting
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message when deleting the account - The user is prompted to check and redo the deletion action.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while deleting categories (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Search category	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the category management section within the administrative interface.
	2. System	The system presents a list of existing categories along with options to add, edit, or delete categories.
	3. Administrator	The administrator uses the search functionality provided by the system to search for a specific category.
	4. System	The system filters the category list based on the search criteria entered by the administrator, displaying relevant results.

	2. Alternative Flow	
	Performed by	Action
	4a. System	The system does not display the searched category.
Notes	<ul style="list-style-type: none">- Ensure that only authorized administrators have access to the category management functionality to maintain data security and integrity.- Implement validation checks to ensure that only valid data is entered or updated for categories.	

Table 7: Usecase 5 - Category management

4.3.6. Use Case 6: Course Management

USECASE 6: COURSE MANAGEMENT		
Author	Group 4	
Purpose	The purpose of this use case is to allow administrators to manage courses within the training management system. This includes adding, editing, and deleting courses, as well as searching for specific courses.	
Requirements Traceability	This use case is traced to the requirement "Course Management" in the system's functional requirements.	
Preconditions	<ul style="list-style-type: none">- The system is running and accessible.- The user has appropriate administrative privileges to access the course management functionality.	
Post conditions	Upon successful execution of the use case: <ul style="list-style-type: none">- New courses are added or existing ones are updated or removed as per the administrator's actions.- The system reflects the changes in the course structure.	
Actors	Administrator: Initiates the course management process by accessing the administrative interface of the system.	
Flow of Events		
Add new account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the course management section within the administrative interface.
	2. System	The system presents a list of existing courses along with options to add, edit, or delete courses.
	3. Administrator	The administrator selects the option to add a new course.
	4. System	The system prompts the administrator to enter the necessary information for the new course, such as name and description.

	5. Administrator	The administrator provides the required information and confirms the addition of the new course.
	6. System	The system checks and confirms additional success.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while adding courses (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Edit account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the course management section within the administrative interface.
	2. System	The system presents a list of existing courses along with options to add, edit, or delete courses.
	3. Administrator	The administrator selects the option to edit an existing course.
	4. System	The system displays a form with pre-filled information for the selected course.
	5. Administrator	The administrator updates the course's information as needed and confirms the changes.

	6. System	The system checks and confirms successful editing
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while editing courses (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Delete account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the course management section within the administrative interface.
	2. System	The system presents a list of existing courses along with options to add, edit, or delete courses.
	3. Administrator	The administrator selects the option to delete an existing course.
	4. System	The system presents a confirmation prompt to ensure the administrator's intention to delete the course.
	5. Administrator	The administrator confirms the deletion, and the course is removed from the system.
	6. System	The system confirms successful deleting

	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message when deleting the account - The user is prompted to check and redo the deletion action.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while deleting courses (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Search course	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the course management section within the administrative interface.
	2. System	The system presents a list of existing courses along with options to add, edit, or delete courses.
	3. Administrator	The administrator uses the search functionality provided by the system to search for a specific course.
	4. System	The system filters the course list based on the search criteria entered by the administrator, displaying relevant results.
	2. Alternative Flow	
	Performed by	Action
	4a. System	The system does not display the searched course.

Assign course into a category	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the course management section within the administrative interface.
	2. System	The system presents a list of existing courses along with options to add, edit, or delete courses.
	3. Administrator	The administrator selects the option to assign a course to a category.
	4. System	The system presents a list of courses available for assignment.
	5. Administrator	The administrator selects a course and chooses the category to which it should be assigned.
	6. System	The system updates the category-course association accordingly.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system reports an error that the course cannot be assigned to a category. - The user is prompted to perform the action again.
Notes	<ul style="list-style-type: none"> - Ensure that only authorized administrators have access to the course management functionality to maintain data security and integrity. - Implement validation checks to ensure that only valid data is entered or updated for courses. 	

Table 8: Usecase 6 - Course management

4.3.7. Use Case 7: Topic Management

USECASE 7: TOPIC MANAGEMENT		
Author	Group 4	
Purpose	The purpose of this use case is to allow administrators to manage topics within the training management system. This includes adding, editing, and deleting topics and assigning topics to specific categories.	
Requirements Traceability	This use case is traced to the requirement "Topic Management" in the system's functional requirements.	
Preconditions	<ul style="list-style-type: none">- The system is running and accessible.- The user has appropriate administrative privileges to access the topic management functionality.	
Post conditions	Upon successful execution of the use case: <ul style="list-style-type: none">- New topics are added or existing ones are updated or removed as per the administrator's actions.- The system reflects the changes in the topic structure and category-topic associations.	
Actors	Administrator: Initiates the course management process by accessing the administrative interface of the system.	
Flow of Events		
Add new account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the topic management section within the administrative interface.
	2. System	The system presents a list of existing topics along with options to add, edit, or delete topics.
	3. Administrator	The administrator selects the option to add a new topic.
	4. System	The system prompts the administrator to enter the necessary information for the new topic.

	5. Administrator	The administrator provides the required information and confirms the addition of the new topic.
	6. System	The system checks and confirms additional success.
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while adding topics (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Edit account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the topic management section within the administrative interface.
	2. System	The system presents a list of existing courses along with options to add, edit, or delete topics.
	3. Administrator	The administrator selects the option to edit an existing topic.
	4. System	The system displays a form with pre-filled information for the selected topic.
	5. Administrator	The administrator updates the topic's information as needed and confirms the changes.

	6. System	The system checks and confirms successful editing
	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message because the information entered is invalid. - Users are reminded to check the information again.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while editing topics (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Delete account	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the topic management section within the administrative interface.
	2. System	The system presents a list of existing topics along with options to add, edit, or delete topics.
	3. Administrator	The administrator selects the option to delete an existing topic.
	4. System	The system presents a confirmation prompt to ensure the administrator's intention to delete the topic.
	5. Administrator	The administrator confirms the deletion, and the topic is removed from the system.
	6. System	The system confirms successful deleting.

	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none"> - The system displays an error message when deleting the account - The user is prompted to check and redo the deletion action.
	3. Exceptions	
	Performed by	Action
	System	If the system encounters errors while deleting topics (e.g., database error), an error message is displayed, and the administrator is prompted to retry or contact support for assistance.
Assign topic into a course	1. Basic Flow	
	Performed by	Action
	1. Administrator	The administrator navigates to the topic management section within the administrative interface.
	2. System	The system presents a list of existing topics along with options to add, edit, or delete topics.
	3. Administrator	The administrator selects the option to assign a topic to a course.
	4. System	The system presents a list of topics available for assignment.
	5. Administrator	The administrator selects a topic and chooses the course to which it should be assigned.
	6. System	The system updates the course-topic association accordingly.

	2. Alternative Flow	
	Performed by	Action
	6a. System	<ul style="list-style-type: none">- The system reports an error that the topic cannot be assigned to a course.- The user is prompted to perform the action again.
Notes	<ul style="list-style-type: none">- Ensure that only authorized administrators have access to the topic management functionality to maintain data security and integrity.- Implement validation checks to ensure that only valid data is entered or updated for topics and category-topic associations.	

Table 9: Usecase 7 - Topic management

