

# Tutor Support System at HCMUT

Assignment's Specification

Ho Chi Minh City University of Technology (HCMUT)  
Faculty of Computer Science and Engineering

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*This specification follows the structure and conventions used in prior course specifications, adapted to the Tutor Support System context.*

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# 1 Assignment's outcome

Upon completion of this assignment, students will be able to:

- Identify stakeholders, roles, objectives, and scope for a university-scale information system.
- Specify functional and non-functional requirements clearly and traceably.
- Model core use-cases for tutoring workflows (registration, matching, booking, feedback).
- Define system integration touchpoints with HCMUT infrastructure (SSO, Data-Core, Library).
- Produce a consistent, submission-ready specification document in L<sup>A</sup>T<sub>E</sub>X.

## 2 Introduction

HCMUT requires a platform to support students in their academic and skills development journey. The **Tutor Support System (TSS)** will modernize the management of the Tutor/Mentor program, enabling scalable operations and data-driven improvement across departments.

## 3 Description

### 3.1 Stakeholders, Roles, and Expectations

#### 3.1.1 Stakeholders

Stakeholders are individuals or entities who can affect or are affected by the project outcomes.

**Primary:** HCMUT staff (customer), course instructors (project managers), development team, designers.

**Secondary:** Students (end-users), tutors, government, competitors.

Stakeholders may be internal (within HCMUT: Office of Academic Affairs, Office of Student Affairs, departments) or external (students, tutors).

#### 3.1.2 Roles

Roles are permissions and capabilities within the system: Student, Tutor, Coordinator, Department Chair, Program Administrator.

#### 3.1.3 Expectations

Each role expects secure access, clear workflows, and reliable performance. Students expect easy registration and booking; tutors expect manageable scheduling; administrators expect robust reporting.

### 3.2 Objectives and Scope

**Objectives** Design and develop an efficient, secure, and scalable software supporting the Tutor/Mentor program:

- Manage tutor/student information (profiles, expertise, support needs).
- Enable registration, selection or automated matching.
- Support scheduling, booking, cancellation, rescheduling (online or in-person).
- Provide progress tracking, feedback, evaluation.
- Generate reports for departments and offices to optimize resources and recognition.
- Integrate with HCMUT SSO/DataCore/Library for consistency and security.

**Scope** This specification covers:

- Core features: profile management, matching, scheduling, notifications, feedback, reporting.
- Integrations: HCMUT\_SSO (auth), HCMUT\_DATACORE (personal data), HC-MUT\_LIBRARY (learning resources).
- Roles: Student, Tutor, Coordinator, Department Chair, Program Admin (RBAC).

**Out of Scope (MVP):** Full production DB, advanced AI features (smart matching, personalization), external integrations beyond HCMUT.

## 4 Functional Requirements

### 4.1 Functional Requirements List

The following table summarizes the functional requirements of the Tutor Support System. Requirements are grouped into thematic categories to ensure clarity and traceability.

**Prioritization Method:** In this project, we applied the MoSCoW prioritization technique to classify functional requirements. This method categorizes requirements into four levels:

- Must: Essential for the system to function; without them, the system fails to meet its objectives.
- Should: Important but not vital; the system can still operate without them in the first release.
- Could: Desirable enhancements that improve usability or efficiency if time/resources allow.
- Won't (this time): Explicitly excluded from the current scope, possibly considered for future releases.

This approach ensures clarity in requirement importance and helps manage project scope effectively.

### 4.2 User & Information Management (FR-UM)

#### • FR-UM.01 – Profile

- *Description:* The system shall allow students and tutors to view and update their personal profiles, with core information (name, student ID, email, role, faculty/major) synchronized from the university's database.
- *Acceptance Criteria:*

- \* Profiles automatically include core fields (name, student ID, email, role, faculty/major) synced from the university database; users are not required to manually enter these fields.
- \* Profile changes are timestamped and stored.
- *Priority:* Must
- **FR-UM.02 – Role-based Access Control**
  - *Description:* The system shall enforce role-based access control to regulate permissions for students, tutors, coordinators, department heads, and administrators.
  - *Acceptance Criteria:*
    - \* Each role has defined permissions.
    - \* Unauthorized access attempts are logged.
  - *Priority:* Must

#### **4.3 Tutor–Student Matching (FR-MAT)**

- **FR-MAT.01 – Manual Tutor Selection**
  - *Description:* The system shall allow students to register for the tutoring program.
  - *Acceptance Criteria:*
    - \* Students can successfully submit a registration request to join the tutoring program.
  - *Priority:* Must
- **FR-MAT.02 – Manual Tutor Selection**
  - *Description:* The system shall allow students to search for and manually select tutors based on expertise, availability, and preferences. Core tutor information (subject, department, schedule) is synchronized from the university database, while teaching preferences are provided by tutors.
  - *Acceptance Criteria:*
    - \* Students can filter tutors by at least three criteria (e.g., subject, availability, preferences).
    - \* Selection creates a pending match awaiting tutor confirmation.
  - *Priority:* Must
- **FR-MAT.03 – Smart Matching**
  - *Description:* The system shall provide automated tutor–student matching using predefined criteria such as subject, availability, and tutor workload. Matching relies on synchronized data from DATACORE combined with tutor-specified preferences.
  - *Acceptance Criteria:*
    - \* System generates a ranked list of tutors with explanation of matching factors.
    - \* Confirmation from both tutor and student finalizes the match.

- *Priority*: Should
- **FR-MAT.04 – Coordinator Assignment**
  - *Description*: The system shall allow coordinators, department chairs, or administrators to manually assign tutors to students when necessary, overriding automated or student-selected matches.
  - *Acceptance Criteria*:
    - \* Only authorized roles can assign tutors.
    - \* Manual assignment overrides previous matches.
    - \* Assignment details (who, when, reason) are logged and traceable.
  - *Priority*: Must

#### **4.4 Session & Scheduling Management (FR-SCH)**

- **FR-SCH.01 – Tutor Availability**
  - *Description*: The system shall allow tutors to set and manage their availability for consultation sessions, synchronized with official university timetables where applicable.
  - *Acceptance Criteria*:
    - \* Only tutors can create, edit, and delete available slots.
    - \* The system prevents overlapping slots.
    - \* Slots cannot conflict with official class schedules imported from DATA-CORE.
  - *Priority*: Must
- **FR-SCH.02 – Session Booking**
  - *Description*: The system shall allow students to book in-person or online sessions with tutors based on available slots.
  - *Acceptance Criteria*:
    - \* Booking is allowed only within available tutor slots.
    - \* The system prevents double-booking of the same slot.
  - *Priority*: Must
- **FR-SCH.03 – Session Modification**
  - *Description*: The system shall allow students to cancel or reschedule booked sessions.
  - *Acceptance Criteria*:
    - \* Cancellation and rescheduling must follow configured rules (e.g., at least 2 hours before session start).
    - \* The system ensures new booking adheres to availability and no conflicts.
  - *Priority*: Must
- **FR-SCH.04 – Notifications & Reminders**
  - *Description*: The system shall automatically send notifications and reminders for upcoming sessions or schedule changes.

- *Acceptance Criteria:*
  - \* Notification sent immediately upon booking, cancellation, or reschedule.
  - \* Reminder sent at least 24h and 1h before session start.
- *Priority:* Must

#### **4.5 Feedback & Progress Tracking (FR-FBK)**

- **FR-FBK.01 – Session Feedback**
  - *Description:* The system shall enable students to provide structured feedback for each completed session.
  - *Acceptance Criteria:*
    - \* Feedback form is available only after session completion.
    - \* Each student can submit one feedback entry per session.
    - \* Feedback is linked to session ID and timestamped.
  - *Priority:* Must
- **FR-FBK.02 – Progress Recording**
  - *Description:* The system shall allow tutors to record mentee progress and generate optional summaries after sessions.
  - *Acceptance Criteria:*
    - \* Only tutors can log progress, which is linked to session ID.
    - \* Summaries may include text notes and optional attachments.
    - \* All records are timestamped and stored for reporting.
  - *Priority:* Should

#### **4.6 Reporting & Analytics (FR-RPT)**

- **FR-RPT.01 – Departmental Reports**
  - *Description:* The system shall generate reports for academic departments to monitor student learning performance.
  - *Acceptance Criteria:*
    - \* Reports include attendance, performance indicators, and session counts.
    - \* Data exportable to CSV/PDF.
  - *Priority:* Should
- **FR-RPT.02 – Academic Affairs Overview**
  - *Description:* The system shall provide overview reports for the Office of Academic Affairs to optimize resource allocation.
  - *Acceptance Criteria:*
    - \* Reports show tutor workload distribution and student demand trends.
    - \* Dashboards update with latest synced data.
  - *Priority:* Should
- **FR-RPT.03 – Student Affairs Outcomes**

- *Description:* The system shall provide summarized participation data for the Office of Student Affairs to support training credits and scholarship considerations.
- *Acceptance Criteria:*
  - \* Reports list eligible students based on configured rules.
  - \* Calculation rules are transparent and logged.
- *Priority:* Should

## 4.7 Integration with HCMUT Infrastructure (FR-INT)

- **FR-INT.01 – HCMUT\_SSO Integration**
  - *Description:* The system shall integrate with HCMUT\_SSO for unified authentication.
  - *Acceptance Criteria:*
    - \* Only valid SSO accounts can log in.
    - \* Single sign-out follows HCMUT SSO rules.
  - *Priority:* Must
- **FR-INT.02 – DATACORE Synchronization**
  - *Description:* The system shall synchronize core personal and academic data from HCMUT\_DATACORE.
  - *Acceptance Criteria:*
    - \* Sync occurs periodically or near real-time.
    - \* Conflicts resolved with DATACORE as source of truth.
  - *Priority:* Must
- **FR-INT.03 – Role assignment**
  - *Description:* The system shall automatically assign roles (student, tutor, coordinator, department chair, administrator) based on centralized HCMUT role data.
  - *Acceptance Criteria:*
    - \* System assigns roles upon login via SSO.
    - \* Role updates in DATACORE are reflected in the system within defined sync intervals.
  - *Priority:* Must
- **FR-INT.04 – Library Resource Linking**
  - *Description:* The system shall connect with HCMUT\_LIBRARY to allow tutors and students to share relevant materials.
  - *Acceptance Criteria:*
    - \* Users can attach library resources to sessions or summaries.
    - \* Access permissions follow HCMUT library rules.
  - *Priority:* Could

## 4.8 Advanced / Optional Features (FR-ADV)

These features are not mandatory for the MVP but can enhance the Tutor Support System if resources permit:

- **FR-ADV.01 – Intelligent Matching (AI Integration)**

- *Description*: The system may leverage AI techniques to optimize tutor-student pairing by analyzing multiple factors such as performance history, learning style, and tutor workload.
- *Acceptance Criteria*:
  - \* AI suggestions ranked with justification.
  - \* Users can compare AI suggestion with manual choice.
- *Priority*: Optional

- **FR-ADV.02 – Online Community Platform**

- *Description*: The system may provide a forum or community space where tutors and students can exchange resources, discuss topics, and collaborate outside formal sessions.
- *Acceptance Criteria*:
  - \* Users can create discussion threads and share files.
  - \* Moderation tools available for coordinators.
- *Priority*: Optional

- **FR-ADV.03 – Personalized Learning Support**

- *Description*: The system may use AI-driven recommendations to suggest learning materials, exercises, or tutoring approaches tailored to individual students.
- *Acceptance Criteria*:
  - \* Recommendations adapt to student's history and feedback.
  - \* Users can accept or reject suggestions.
- *Priority*: Optional

- **FR-ADV.04 – Multi-Program Tutoring**

- *Description*: The system may support both academic tutoring (courses, skills) and non-academic mentoring (career guidance, soft skills).
- *Acceptance Criteria*:
  - \* System allows defining and tracking multiple tutoring program types.
  - \* Reports distinguish between academic and non-academic activities.
- *Priority*: Optional

## 4.9 Non-interactive Functional Requirements (FR-NI)

- **FR-NI-01 – Automatic Notifications**

- *Description*: The system shall automatically send confirmation, reminder, and cancellation/rescheduling notifications to students and tutors without manual intervention.
- *Priority*: Must

- **FR-NI-02 – DataCore Sync**

- *Description:* The system shall periodically synchronize personal data (name, ID, faculty, email, status) from HCMUT\_DATACORE.
- *Trigger:* Hourly schedule + on change-webhook
- *Output:* Up-to-date user records with change log
- *Acceptance Criteria:*  $\geq 99\%$  updates reflected within 10 minutes of source change.
- *Priority:* Must

- **FR-NI-03 – Automatic Inactive Detection**

- *Description:* The system should detect logged-in accounts with no activity for a specific period of time and log them out to maintain stability and security.
- *Acceptance Criteria:*
  - \* The system saves the state of the inactive account before logging out.
  - \* The threshold for inactive time is dynamic, depending on the state of the system.
- *Priority:* Optional

- **FR-NI-04 – Scheduled Database Cleanup**

- *Description:* The system shall automatically perform database cleanup on a scheduled basis, removing obsolete temporary data, expired logs, and error records to maintain storage efficiency and system performance.
- *Acceptance Criteria:*
  - \* Temporary data and logs older than 12 months are automatically deleted or archived.
  - \* Cleanup runs during off-peak hours to avoid disruption.
  - \* A cleanup summary report (records removed, storage freed) is logged.
  - \* Cleanup failures trigger an alert for administrators.
- *Priority:* Should

- **FR-NI-05 – Disaster Recovery & Backup**

- *Description:* The system shall maintain automated backup and disaster recovery mechanisms to ensure data resilience and continuity in case of failure or outage.
- *Acceptance Criteria:*
  - \* Full backups daily; incremental backups every 15 minutes.
  - \* Backups encrypted and stored in two geographically separate locations.
  - \* RPO  $\leq 15$  minutes, RTO  $\leq 4$  hours.
  - \* Backup integrity verified after each operation.
  - \* Failed backups trigger administrator alerts.
- *Priority:* Should

- **FR-NI-06 – Attendance Logging**

- *Description:* The system shall automatically mark attendance when a student

joins an online tutoring session via the platform.

- *Acceptance Criteria:*
  - \* Attendance log created within 1 minute of session start.
  - \* Logs include session ID, student ID, timestamp.
- *Priority:* Should

## 5 Non-Functional Requirements

### 5.1 Performance Requirements

- NFR1: Concurrent Users: The system shall handle at least **1000 concurrent users** without degradation, verified by load testing.
- NFR2: Response Time: 95% of key actions (login, enrollment, course access, page load) shall complete within **3 seconds** under normal load.
- NFR3: Real-Time Notifications: Notifications (reminders, announcements, deadlines) shall be delivered within **2 seconds** of the triggering event in 95% of cases.

### 5.2 Security & Reliability Requirements

- NFR4: Data Encryption: All personal and academic data shall be encrypted at rest with **AES-256** and in transit with **TLS 1.2 or higher**.
- NFR5: Access Control & Logging: 100% of authentication and access attempts shall be logged and retained for at least **90 days**.
- NFR6: Uptime: The system shall provide at least **99% uptime** during the academic year (excluding scheduled maintenance), monitored monthly.
- NFR7: Data Integrity: Recovery testing shall confirm **zero data loss** during transient failures; operations shall be idempotent.

### 5.3 Usability & Accessibility Requirements

- NFR8: User Interface: Usability testing (System Usability Scale) shall achieve a score of at least **80/100**.
- NFR9: Task Simplicity: Key workflows (course enrollment, submission, reschedule) shall require **no more than 3 steps**.
- NFR10: Multi-Platform Support: The system shall function correctly on at least **3 major browsers** (Chrome, Firefox, Edge) and on **desktop, tablet, and smartphone**.
- NFR11: Accessibility Standards: The system shall meet **WCAG 2.1 AA** accessibility compliance.

### 5.4 Software Quality Attributes

- NFR12: Scalability: The system shall support a **50% increase in users** beyond baseline load without major reconfiguration.

- NFR13: Maintainability: The codebase shall achieve at least **80% unit test coverage** and pass linting with no critical errors.
- NFR14: Extensibility: Adding a new feature (e.g., adaptive learning, AI tutor matching) shall require no more than **2 person-weeks** of integration effort.
- NFR15: Observability: The system shall provide logs covering **100% of authentication and enrollment events** and collect usage metrics (active users, completed courses) with **5-minute granularity**.

## 5.5 Business Rules

- NFR16: Legal Compliance: The system shall comply with Vietnamese data protection laws and pass an annual **compliance audit with zero critical findings**.

# 6 Use-Case View

## 6.1 General Use-Case Diagram

Placeholder for diagram:

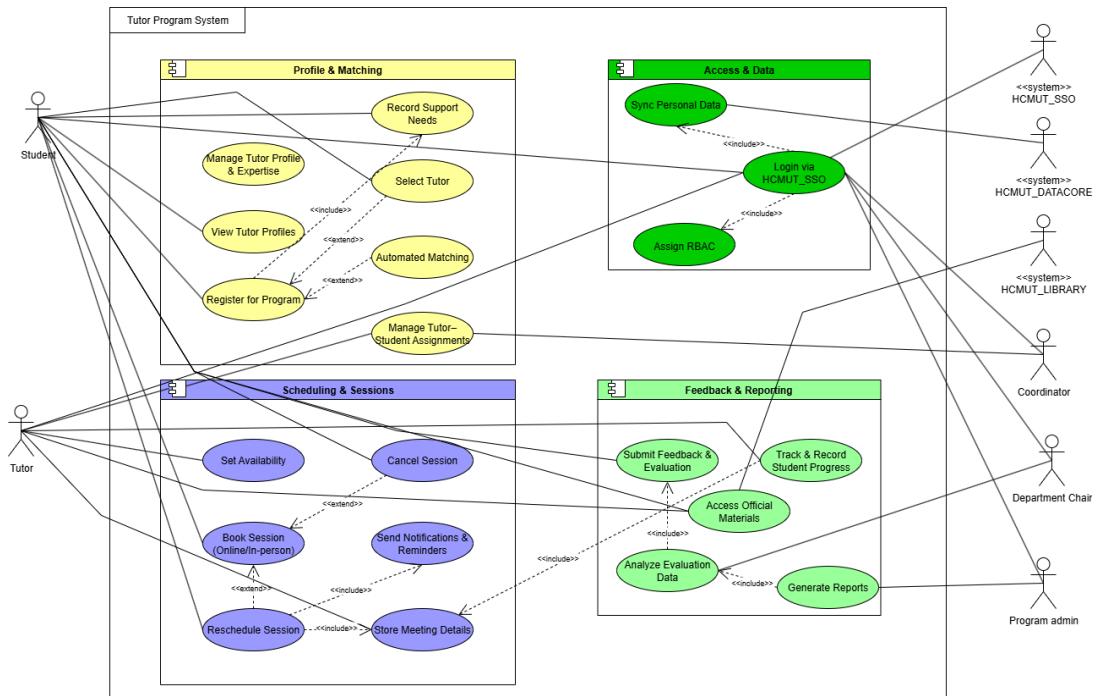
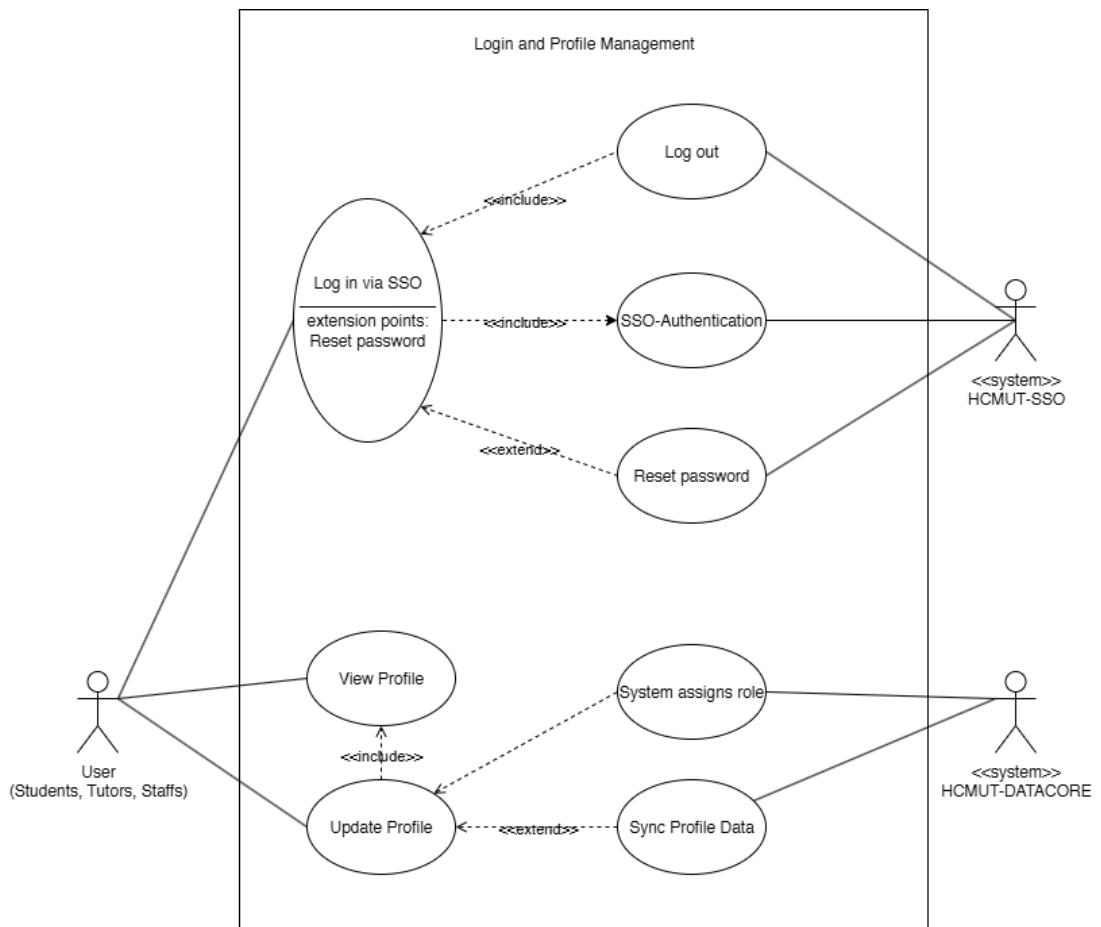


Figure 1: General Tutor program system

## 6.2 UC-01 Log in & Profile Management



**Figure 2:** Log in and Manage Profile

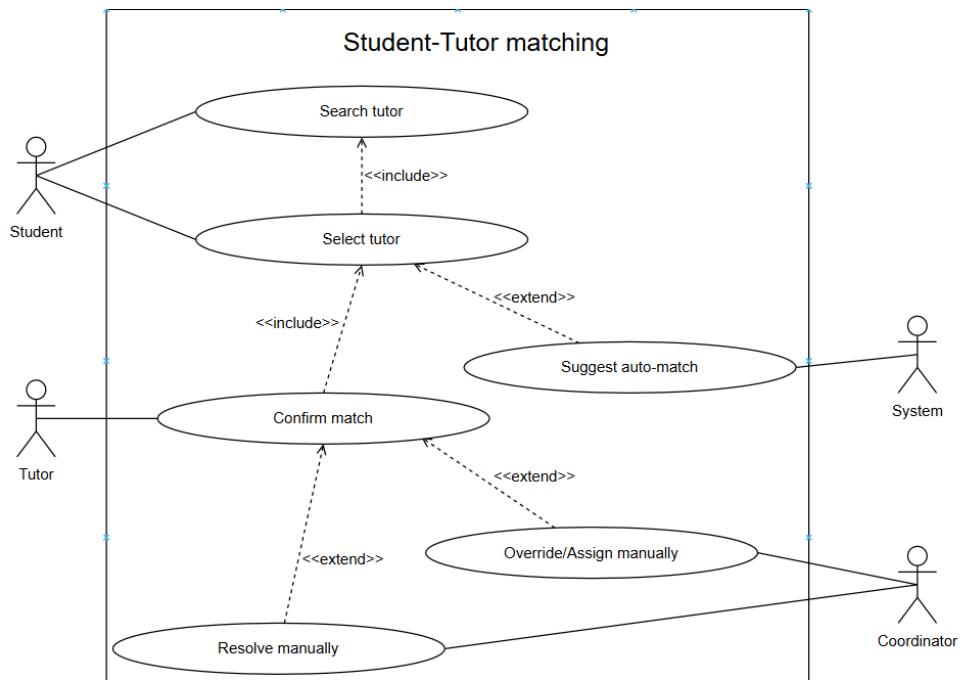
<b>Use-case ID</b>	UC-01a
<b>Use-case name</b>	Login via SSO
<b>Use-case overview</b>	To allow students, tutors, and staff to log in securely via HCMUT_SSO with role assignment handled by the system.
<b>Actors</b>	User (Students, Tutors, Staff), HCMUT_SSO, System
<b>Preconditions</b>	<ol style="list-style-type: none"> <li>1. User has valid SSO credentials.</li> <li>2. HCMUT_SSO service is available.</li> </ol>
<b>Trigger</b>	User selects the “Login via SSO” option.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. User initiates login via HCMUT_SSO.</li> <li>2. System sends authentication request to SSO service.</li> <li>3. HCMUT_SSO validates credentials.</li> <li>4. On success, the system fetches user data and assigns role.</li> <li>5. On failure, the system denies access.</li> </ol>
<b>Postconditions</b>	User is authenticated and session established; role assignment is ready for system use.
<b>Alternative Flows</b>	A1: Invalid login → Access denied with error message. A2: Role update in DATACORE synced during login.
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. SSO service unavailable → System shows maintenance/unavailable message.</li> <li>2. Network error → User prompted to retry login.</li> </ol>

Table 1: Use Case UC-01a: Login via SSO

<b>Use-case ID</b>	UC-01b
<b>Use-case name</b>	Profile Management
<b>Use-case overview</b>	To allow students and tutors to view and update their profiles, with core data synchronized from HCMUT_DATACORE.
<b>Actors</b>	Student, Tutor, HCMUT_DATACORE, System
<b>Preconditions</b>	<ol style="list-style-type: none"> <li>1. User is authenticated via SSO.</li> <li>2. Profile data exists in DATACORE.</li> </ol>
<b>Trigger</b>	User selects the “View/Update Profile” option.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. System retrieves profile information from DATACORE.</li> <li>2. User views profile fields (ID, name, email, faculty, role).</li> <li>3. User updates non-core profile details.</li> <li>4. System validates and saves changes.</li> <li>5. System syncs updated data with DATACORE.</li> </ol>
<b>Postconditions</b>	User profile is updated and synchronized with DATACORE; changes are timestamped and logged.
<b>Alternative Flows</b>	A1: DATACORE unavailable → Updates stored locally until sync resumes.
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. Invalid update request → System rejects and shows error.</li> <li>2. Sync conflict with DATACORE → DATACORE treated as source of truth.</li> </ol>

Table 2: Use Case UC-01b: Profile Management

### 6.3 UC-02 Tutor-Student Matching

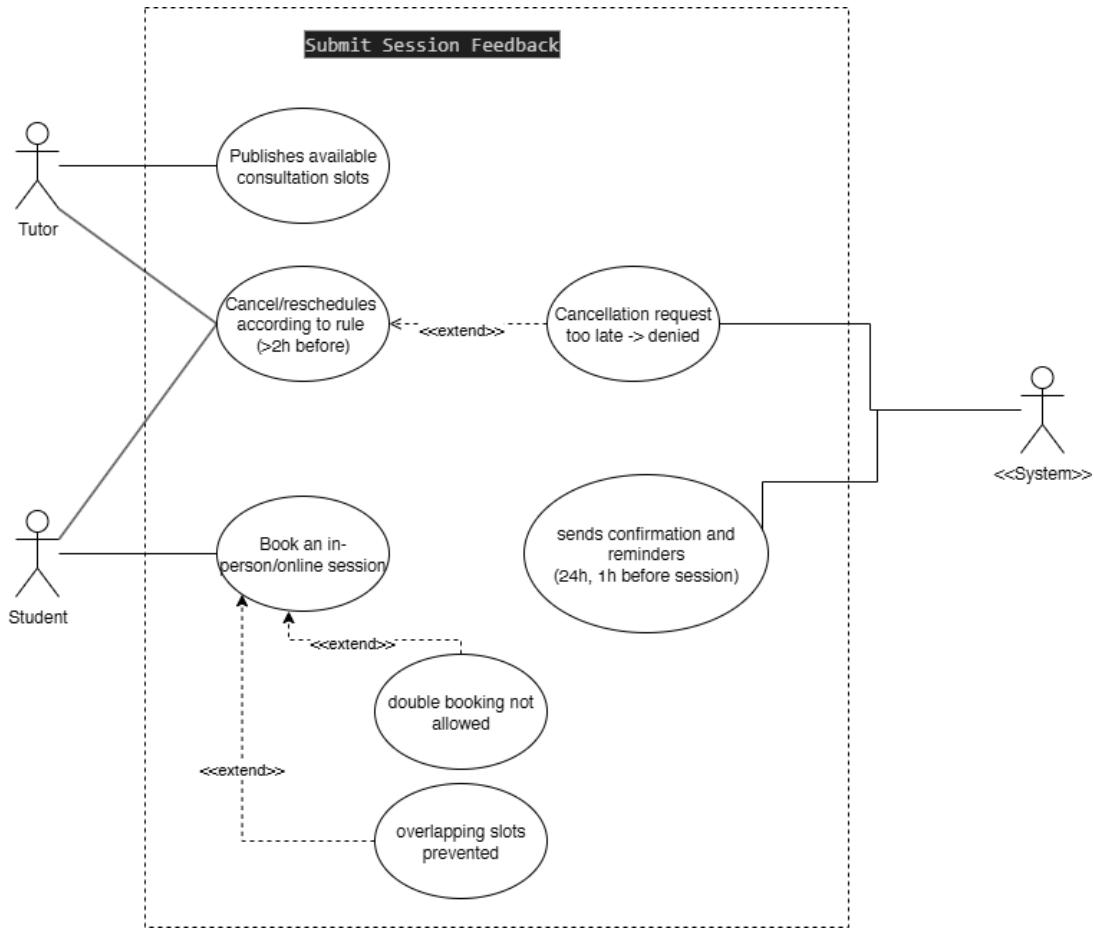


**Figure 3:** Tutor–Student Matching

<b>Use-case ID</b>	UC-02
<b>Use-case name</b>	Tutor–Student Matching
<b>Use-case overview</b>	To allow students to search and select tutors manually or request an automated match, with tutor confirmation and coordinator intervention when necessary.
<b>Actors</b>	Student (primary), Tutor, Coordinator, System
<b>Preconditions</b>	<ol style="list-style-type: none"> <li>1. Student and tutor profiles exist in the system.</li> <li>2. The system is operational and accessible.</li> <li>3. Student is authenticated in the system.</li> </ol>
<b>Trigger</b>	Student initiates a search for tutors or requests an auto-match.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Student searches for tutors by subject, availability, or preferences.</li> <li>2. Student selects a tutor; a pending match is created.</li> <li>3. System may suggest an auto-match (ranked list) based on the student's criteria.</li> <li>4. Tutor reviews the pending match and confirms the match.</li> <li>5. If confirmed, the system finalizes and logs the pairing.</li> </ol>
<b>Postconditions</b>	A tutor–student pairing is established and logged in the system.
<b>Alternative Flows</b>	<ol style="list-style-type: none"> <li>1. Auto-match rejected by student or tutor → Coordinator resolves manually.</li> <li>2. No tutors found → System suggests broadening search criteria.</li> <li>3. Tutor does not respond within time limit → Coordinator is notified to assign a tutor.</li> </ol>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. Network failure prevents search or confirmation (system prompts user to retry).</li> <li>2. Tutor or student profile missing/corrupted → System logs an error and notifies Coordinator.</li> </ol>

Table 3: Use Case UC-02: Tutor–Student Matching

## 6.4 UC-03 Session Scheduling Management



**Figure 4:** Session Scheduling Management

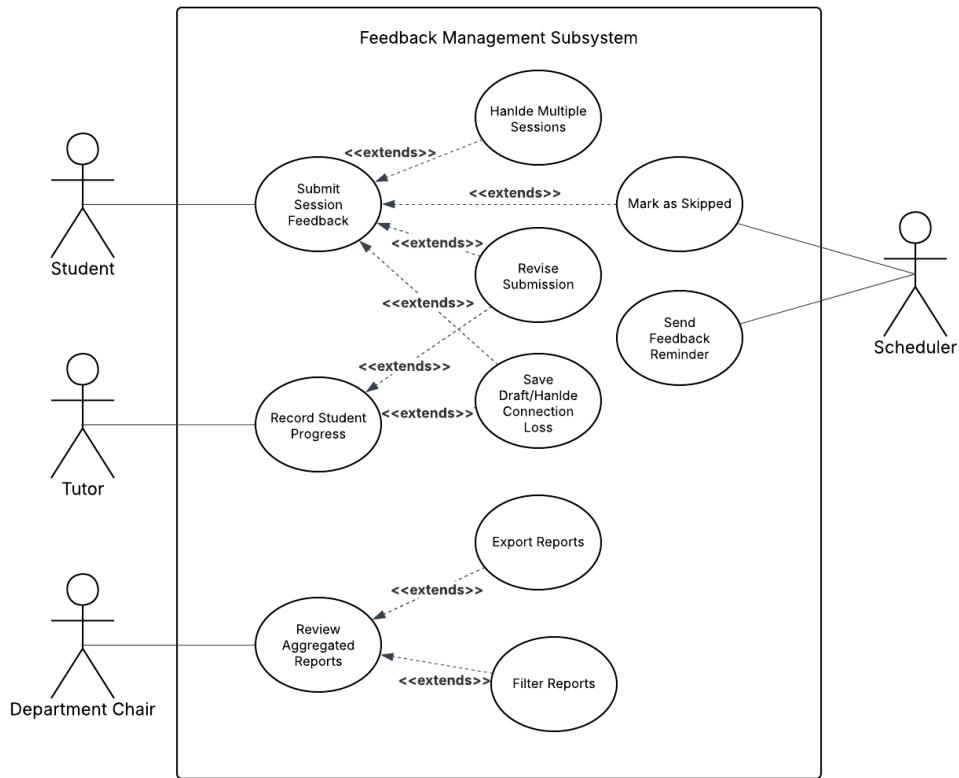
<b>Use-case ID</b>	UC-03a
<b>Use-case name</b>	Publish and Manage Tutor Availability
<b>Overview</b>	To allow a tutor to create, edit, and manage available consultation slots, while the system prevents overlapping sessions and validates scheduling rules.
<b>Actors</b>	Tutor, System
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>• Tutor is authenticated in the system.</li> <li>• The scheduling database is accessible.</li> </ul>
<b>Trigger</b>	Tutor selects “Set Availability” or modifies existing slots.
<b>Main Flow (Steps)</b>	<ol style="list-style-type: none"> <li>1. Tutor publishes available consultation slots.</li> <li>2. System checks for overlapping slots.</li> <li>3. If no conflicts are found, slots are confirmed and saved.</li> <li>4. Tutor may later edit or delete slots before they are booked.</li> </ol>
<b>Postconditions</b>	<ul style="list-style-type: none"> <li>• Valid time slots are stored in the system and visible to students.</li> </ul>
<b>Alternative Flows</b>	AF1: Overlapping slot detected → system rejects slot creation and displays conflict message.
<b>Exception Flows</b>	<ul style="list-style-type: none"> <li>• Database or connection error → slot creation aborted, system logs error.</li> </ul>

Table 4: Use Case UC-03a: Publish and Manage Tutor Availability

<b>Use-case ID</b>	UC-03b
<b>Use-case name</b>	Session Booking, Reminders, and Cancellation Rules
<b>Overview</b>	To allow a student to book an in-person or online session with a tutor, receive automatic confirmations and reminders, and manage cancellations or reschedules according to defined rules.
<b>Actors</b>	Student, Tutor, System
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>• Tutor has published available slots.</li> <li>• Student is authenticated and matched with a tutor.</li> </ul>
<b>Trigger</b>	Student initiates a booking or a cancellation/reschedule request.
<b>Main Flow (Steps)</b>	<ol style="list-style-type: none"> <li>1. Student views tutor's available consultation slots.</li> <li>2. Student selects a preferred slot and submits booking.</li> <li>3. System checks for double booking or slot conflicts.</li> <li>4. Booking is confirmed, and notifications are sent to student and tutor.</li> <li>5. System automatically sends reminders (24h and 1h before the session).</li> <li>6. If cancellation or reschedule is requested <math>\geq 2h</math> before session it is approved.</li> </ol>
<b>Postconditions</b>	<ul style="list-style-type: none"> <li>• Session status updated (booked, rescheduled, or cancelled).</li> <li>• All notifications are logged and delivered.</li> </ul>
<b>Alternative Flows</b>	<p>AF1: Cancellation request too late (<math>&lt;2h</math> before) → denied with reason.</p> <p>AF2: Tutor unavailable → student notified and slot reopened.</p>
<b>Exception Flows</b>	<ul style="list-style-type: none"> <li>• Network or database failure → transaction aborted, retry suggested.</li> </ul>

Table 5: Use Case UC-03b: Session Booking, Reminders, and Cancellation Rules

## 6.5 UC-04 Feedback & Progress Tracking



**Figure 5:** Submit Session Feedback

<b>Use-case ID</b>	UC-04a
<b>Use-case name</b>	Submit Session Feedback
<b>Use-case overview</b>	To allow a student to submit structured feedback after a tutoring session. The feedback is linked to the session and stored for later evaluation and reporting.
<b>Actors</b>	<ul style="list-style-type: none"> <li>• Student (primary)</li> <li>• Scheduler (secondary, for reminders and marking ‘Skipped’)</li> </ul>
<b>Preconditions</b>	<ol style="list-style-type: none"> <li>1. A tutoring session has been completed.</li> <li>2. The system is running and accessible.</li> <li>3. Student is authenticated in the system.</li> </ol>
<b>Trigger</b>	The student clicks the “Submit Feedback” option after the session is completed.

Main Flow (Steps)	<ol style="list-style-type: none"> <li>1. System displays a feedback form linked to the completed session.</li> <li>2. Student fills in and submits the structured feedback.</li> <li>3. System validates the input and saves the feedback in the database.</li> <li>4. System links the feedback to the corresponding session.</li> </ol>
Postconditions	<ul style="list-style-type: none"> <li>• Feedback is stored in the database and linked to the correct session.</li> <li>• If skipped, the system records a “Feedback Skipped” status for that session.</li> <li>• Data is available for tutors and department chairs in aggregated reports.</li> </ul>
Alternative Flows	<ol style="list-style-type: none"> <li>1. <b>Multiple Session Feedback:</b> If multiple sessions are pending, the system displays a list and allows the student to submit feedback sequentially.</li> <li>2. <b>Draft Save/Connection Loss:</b> The student may save incomplete feedback as a draft and return later. System automatically saves the draft if connection is lost before final submission.</li> <li>3. <b>Feedback Revision:</b> Within a defined grace period (e.g., 24h), the student may edit and resubmit feedback; the updated version replaces the original.</li> <li>4. <b>Skipped Feedback:</b> If no feedback is submitted within the allowed time, the Scheduler triggers a process to mark the session’s feedback status as “Skipped.”</li> </ol>
Exception Flows	<ul style="list-style-type: none"> <li>• <b>Database Error:</b> If the system fails to save the final submission due to a database error, it logs the error and prompts the student to retry later.</li> <li>• <b>Missing Session Record:</b> If the session record is missing or corrupted, the system logs an error and notifies the coordinator.</li> </ul>

Table 6: Use Case UC-04a: Submit Session Feedback

Use-case ID	UC-04b
Use-case name	Record Student Progress
Use-case overview	To allow tutors to record student progress and optionally add session summaries for reference and tracking purposes.
Actors	Tutor

<b>Preconditions</b>	1. A tutoring session has been completed. 2. The system is running and accessible. 3. Tutor is authenticated in the system.
<b>Trigger</b>	Tutor accesses the session record and selects “Record Progress.”
<b>Steps</b>	1. Tutor opens the specific session record. 2. Tutor enters progress notes and, optionally, a session summary. 3. Tutor submits the record. 4. System validates the input and saves the record, linking it to the session.
<b>Postconditions</b>	1. Student progress and optional session summary are saved. 2. Data is linked to the session and available for departmental review.
<b>Alternative Flows</b>	A1: Optional Summary → Tutor skips writing a session summary (only progress notes are saved). A2: Draft Save / Connection Loss → Tutor may save incomplete notes as a draft; the system auto-saves the draft if the connection is lost. A3: Note Revision → Within a 24-hour grace period, tutor may edit and resubmit notes; the new version replaces the previous record.
<b>Exception Flow</b>	1. Database error → System logs the issue and notifies the tutor to retry. 2. Missing or locked session → System notifies the tutor and logs the error.
<b>Priority</b>	Should

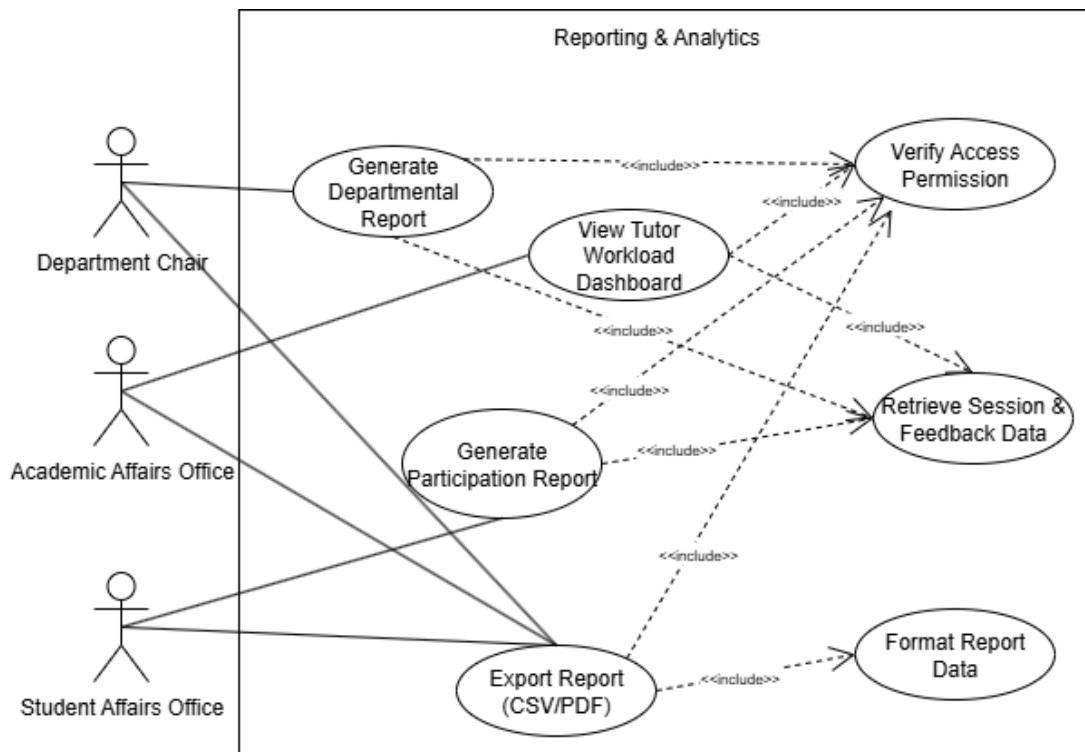
Table 7: Use Case UC-04b: Record Student Progress

<b>Use-case ID</b>	UC-04c
<b>Use-case name</b>	Review Aggregated Reports (Feedback & Progress)
<b>Overview</b>	To allow the department chair to review aggregated feedback and progress data for monitoring tutor performance and program effectiveness.
<b>Actors</b>	Department Chair
<b>Preconditions</b>	1. Feedback and progress records exist in the database. 2. The system is running and accessible. 3. Department Chair is authenticated in the system.
<b>Trigger</b>	Department Chair selects “Aggregated Reports Overview.”

<b>Main Flow (Steps)</b>	<ol style="list-style-type: none"> <li>1. Department Chair selects report criteria (e.g., date range, tutor, course).</li> <li>2. System retrieves all relevant feedback and progress data.</li> <li>3. System processes and displays aggregated statistics, charts, or reports.</li> </ol>
<b>Postconditions</b>	<ul style="list-style-type: none"> <li>• Aggregated data is available for decision-making.</li> <li>• Reports may be exported or stored for institutional use.</li> </ul>
<b>Alternative Flows</b>	<p>AF1 <b>Filtering:</b> Department Chair filters or drills down data by tutor, course, or specific time period.</p> <p>AF2 <b>Export Report:</b> Department Chair exports the report in a chosen format (e.g., PDF, CSV) for external analysis.</p>
<b>Exception Flows</b>	<ul style="list-style-type: none"> <li>• <b>Database/Retrieval Failure:</b> If database retrieval fails, the system shows a technical error message and logs the issue for system administrators.</li> <li>• <b>No Data:</b> If no data matches the selected criteria, the system displays a clear message: “No data available for this selection.”</li> </ul>

Table 8: Use Case UC-04c: Review Aggregated Reports

## 6.6 UC-05 Reporting & Analytics



**Figure 6:** Reporting and Analytics

<b>Use-case ID</b>	UC-05a
<b>Use-case name</b>	Generate Departmental Report
<b>Use-case overview</b>	Department Chair generates a department-level report (attendance, performance, session counts) for academic monitoring and decisions.
<b>Actors</b>	Department Chair
<b>Preconditions</b>	<ol style="list-style-type: none"> <li>1. Authenticated and authorized to view departmental reports.</li> <li>2. Sessions, feedback, and (if applicable) progress data exist.</li> <li>3. System is operational.</li> </ol>
<b>Trigger</b>	Chair opens “Reporting” and selects “Departmental Report”.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Set filters (term/date, program/department, tutor/cohort).</li> <li>2. System retrieves and analyzes metrics (attendance, performance, session counts).</li> <li>3. System displays tables/charts with data-source notes.</li> <li>4. Optional: Export CSV/PDF with metadata (generation time, filters, version); log action.</li> </ol>
<b>Postconditions</b>	<ol style="list-style-type: none"> <li>1. Departmental report displayed; optional file generated.</li> <li>2. Action recorded in the audit log.</li> </ol>
<b>Alternative Flows</b>	<ol style="list-style-type: none"> <li>1. Change filters/scope → system refreshes results.</li> </ol>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. No data for selected criteria → show “No data available for this selection.”</li> <li>2. Export error (I/O or size) → suggest narrowing scope or retrying.</li> <li>3. Data source unavailable → show service notice; allow retry when available.</li> </ol>

Table 9: Use Case UC-05a: Generate Departmental Report

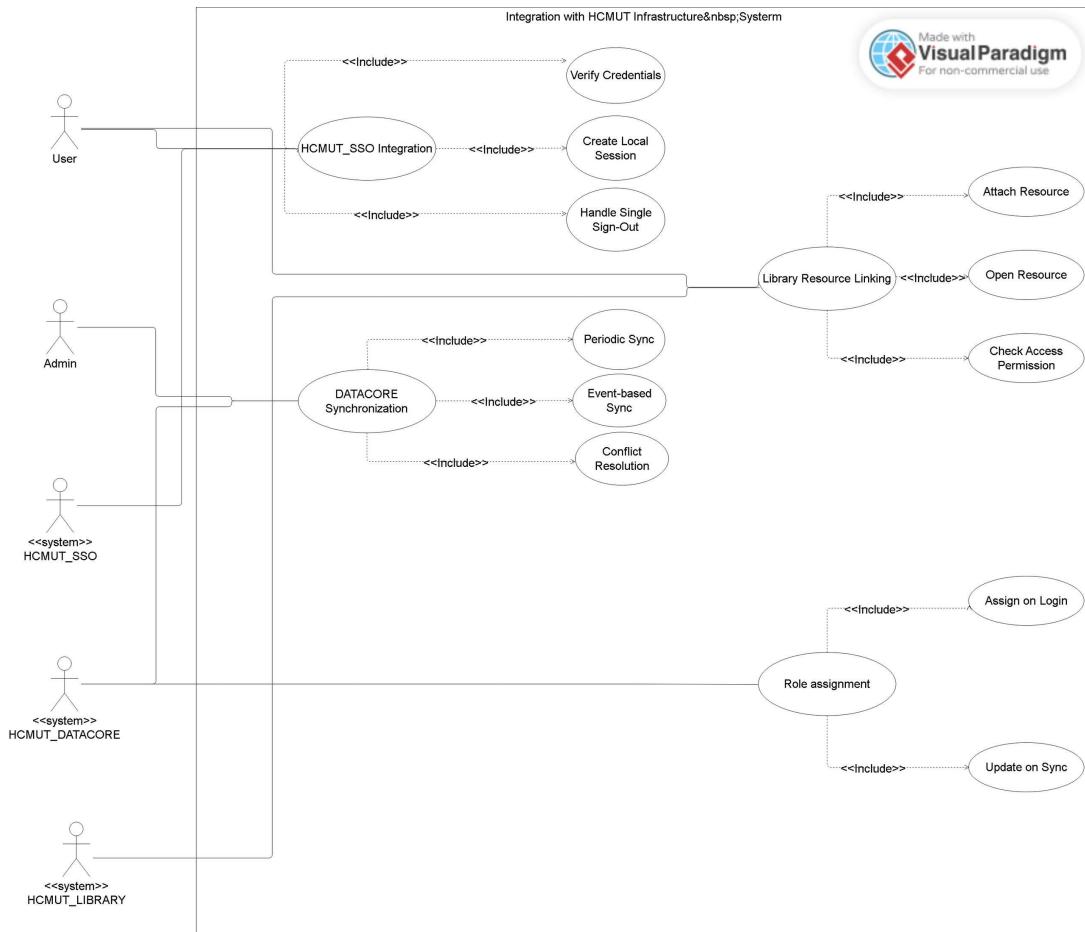
<b>Use-case ID</b>	UC-05b
<b>Use-case name</b>	View Tutor Workload Dashboard
<b>Use-case overview</b>	Academic Affairs views tutor workload and student demand to allocate resources effectively.
<b>Actors</b>	Academic Affairs Office
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>1. Authenticated and authorized for workload dashboards.</li> <li>2. Sessions/booking and feedback data exist.</li> <li>3. System is operational.</li> </ul>
<b>Trigger</b>	Office opens “Workload & Demand” dashboard.
<b>Steps</b>	<ul style="list-style-type: none"> <li>1. Select filters (term/date, department/program).</li> <li>2. System aggregates tutor load and demand indicators.</li> <li>3. System displays dashboard (tables/charts, drill-down).</li> <li>4. Optional: Export CSV/PDF with metadata; log action.</li> </ul>
<b>Postconditions</b>	<ul style="list-style-type: none"> <li>1. Workload dashboard visible; optional export ready.</li> <li>2. Access recorded in the audit log.</li> </ul>
<b>Alternative Flows</b>	<ul style="list-style-type: none"> <li>1. Drill-down by tutor/program → refresh view.</li> </ul>
<b>Exception Flow</b>	<ul style="list-style-type: none"> <li>1. No data for selected criteria → show “No data available for this selection.”</li> <li>2. Export error (I/O or size) → suggest narrowing scope or retrying.</li> <li>3. Data source unavailable → show service notice; allow retry when available.</li> </ul>

Table 10: Use Case UC-05b: View Tutor Workload Dashboard

<b>Use-case ID</b>	UC-05c
<b>Use-case name</b>	Generate Participation Report
<b>Use-case overview</b>	Student Affairs generates participation reports for credit/scholarship consideration.
<b>Actors</b>	Student Affairs Office
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>1. Authenticated and authorized for participation reports.</li> <li>2. Sessions and attendance/feedback records exist.</li> <li>3. System is operational.</li> </ul>
<b>Trigger</b>	Office selects “Participation Report”.
<b>Steps</b>	<ul style="list-style-type: none"> <li>1. Choose filters (term/date, cohort, program, thresholds).</li> <li>2. System compiles participation metrics and eligibility indicators.</li> <li>3. System displays results; Optional: export CSV/PDF with metadata; log action.</li> </ul>
<b>Postconditions</b>	<ul style="list-style-type: none"> <li>1. Participation report displayed; optional file generated.</li> <li>2. Action logged.</li> </ul>
<b>Alternative Flows</b>	<ul style="list-style-type: none"> <li>1. Adjust filters/criteria → refresh results.</li> </ul>
<b>Exception Flow</b>	<ul style="list-style-type: none"> <li>1. No data for selected criteria → show “No data available for this selection.”</li> <li>2. Export error (I/O or size) → suggest narrowing scope or retrying.</li> <li>3. Data source unavailable → show service notice; allow retry when available.</li> </ul>

Table 11: Use Case UC-05c: Generate Participation Report

## 6.7 UC-06 Integration with HCMUT Infrastructure



**Figure 7:** Integration with HCMUT Infrastructure

<b>Use-case ID</b>	UC-06a
<b>Use-case name</b>	HCMUT_SSO Integration
<b>Use-case overview</b>	The system integrates with HCMUT_SSO for unified authentication, allowing users to log in using university credentials and automatically manage single sign-out.
<b>Actors</b>	User, System, HCMUT_SSO
<b>Preconditions</b>	HCMUT_SSO service is operational and reachable.
<b>Trigger</b>	User initiates login via HCMUT_SSO.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. User selects “Login with HCMUT_SSO”.</li> <li>2. System redirects to the authentication portal.</li> <li>3. HCMUT_SSO validates credentials and returns a token.</li> <li>4. System verifies the token and creates a session.</li> <li>5. Upon sign-out at SSO, the system terminates the local session.</li> </ol>
<b>Postconditions</b>	<ol style="list-style-type: none"> <li>1. User is successfully authenticated.</li> <li>2. Single sign-out ensures session consistency.</li> </ol>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. Invalid or expired token → login attempt rejected.</li> <li>2. SSO service unavailable → system displays maintenance message.</li> </ol>
<b>Priority</b>	Must

Table 12: Use Case UC-06a: HCMUT\_SSO Integration

<b>Use-case ID</b>	UC-06b
<b>Use-case name</b>	DATACORE Synchronization
<b>Use-case overview</b>	The system synchronizes personal and academic data from HCMUT_DATACORE periodically or in near real-time to ensure data consistency and reduce manual entry.
<b>Actors</b>	System, HCMUT_DATACORE, Administrator
<b>Preconditions</b>	DATACORE APIs are online and accessible.
<b>Trigger</b>	Scheduled synchronization or data-change event detected.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. System triggers synchronization with DATACORE.</li> <li>2. Retrieve updated profiles and academic data.</li> <li>3. Validate and compare data with local records.</li> <li>4. Update local data using DATACORE as source of truth.</li> <li>5. Log synchronization status and timestamp.</li> </ol>
<b>Postconditions</b>	<ol style="list-style-type: none"> <li>1. Local data mirrors DATACORE.</li> <li>2. Synchronization events logged for auditing.</li> </ol>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. Connection timeout or API error → retry with exponential backoff.</li> <li>2. Invalid data format → skip record and log validation error.</li> </ol>
<b>Priority</b>	Must

Table 13: Use Case UC-06b: DATACORE Synchronization

<b>Use-case ID</b>	UC-06c
<b>Use-case name</b>	Role Assignment
<b>Use-case overview</b>	The system automatically assigns user roles (student, tutor, coordinator, department chair, or administrator) based on centralized role data from DATACORE and SSO.
<b>Actors</b>	User, System, HCMUT_DATACORE
<b>Preconditions</b>	User is authenticated via SSO and DATACORE role data is available.
<b>Trigger</b>	User login or scheduled role update.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Retrieve role mapping from DATACORE.</li> <li>2. Match user ID with centralized role data.</li> <li>3. Assign permissions based on role.</li> <li>4. Apply changes in access-control policies.</li> <li>5. Log the role-assignment event.</li> </ol>
<b>Postconditions</b>	<ol style="list-style-type: none"> <li>1. User roles align with centralized data.</li> <li>2. Updated permissions take effect immediately.</li> </ol>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. Role data missing → assign default “student” role and notify admin.</li> <li>2. Role conflict → logged and flagged for manual verification.</li> </ol>
<b>Priority</b>	Must

Table 14: Use Case UC-06c: Role Assignment

<b>Use-case ID</b>	UC-06d
<b>Use-case name</b>	Library Resource Linking
<b>Use-case overview</b>	The system connects with HCMUT_LIBRARY to let tutors and students attach or access library materials securely within tutoring sessions or summaries.
<b>Actors</b>	Student, Tutor, System, HCMUT_LIBRARY
<b>Preconditions</b>	Library API and authentication services are available.
<b>Trigger</b>	User attaches or opens a library resource.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. User searches or selects a library resource.</li> <li>2. System requests metadata and access permissions.</li> <li>3. Verify user eligibility via role-based access.</li> <li>4. Attach or open the resource in session view.</li> <li>5. Log the access event.</li> </ol>
<b>Postconditions</b>	<ol style="list-style-type: none"> <li>1. Resource successfully linked to the session or summary.</li> <li>2. Access rights enforced per library policy.</li> </ol>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. Access denied → system displays permission error.</li> <li>2. Library service unavailable → prompt user to retry or queue attachment.</li> </ol>
<b>Priority</b>	Could

Table 15: Use Case UC-06d: Library Resource Linking

## 6.8 UC-07 Advanced / Optional Features

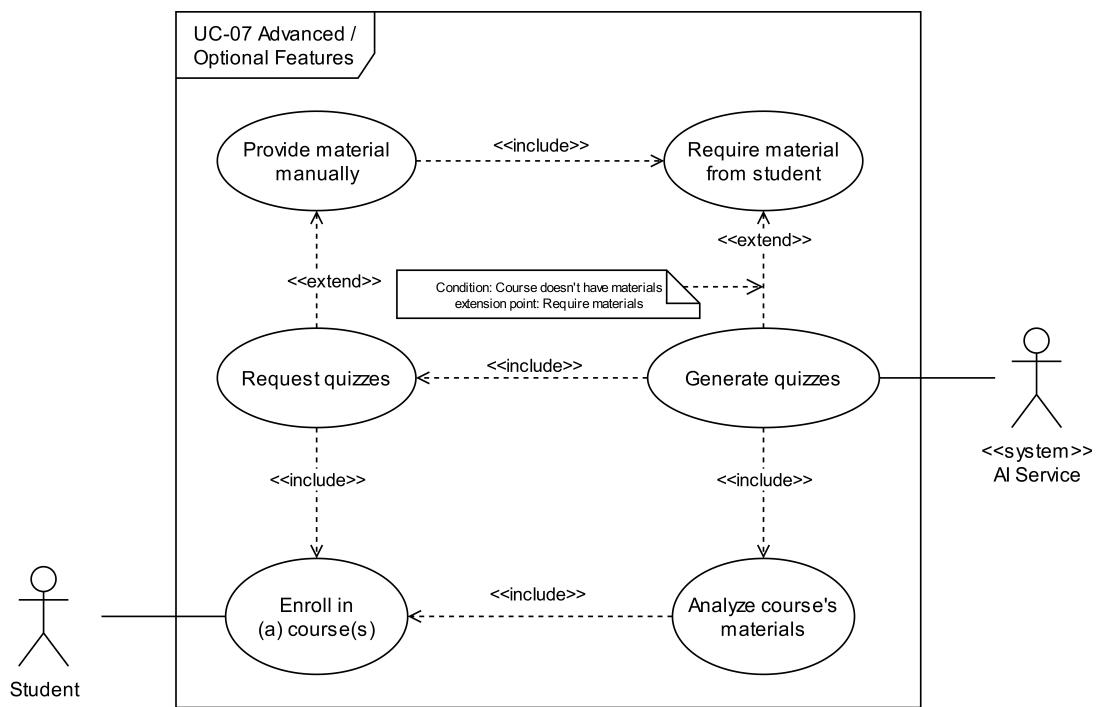


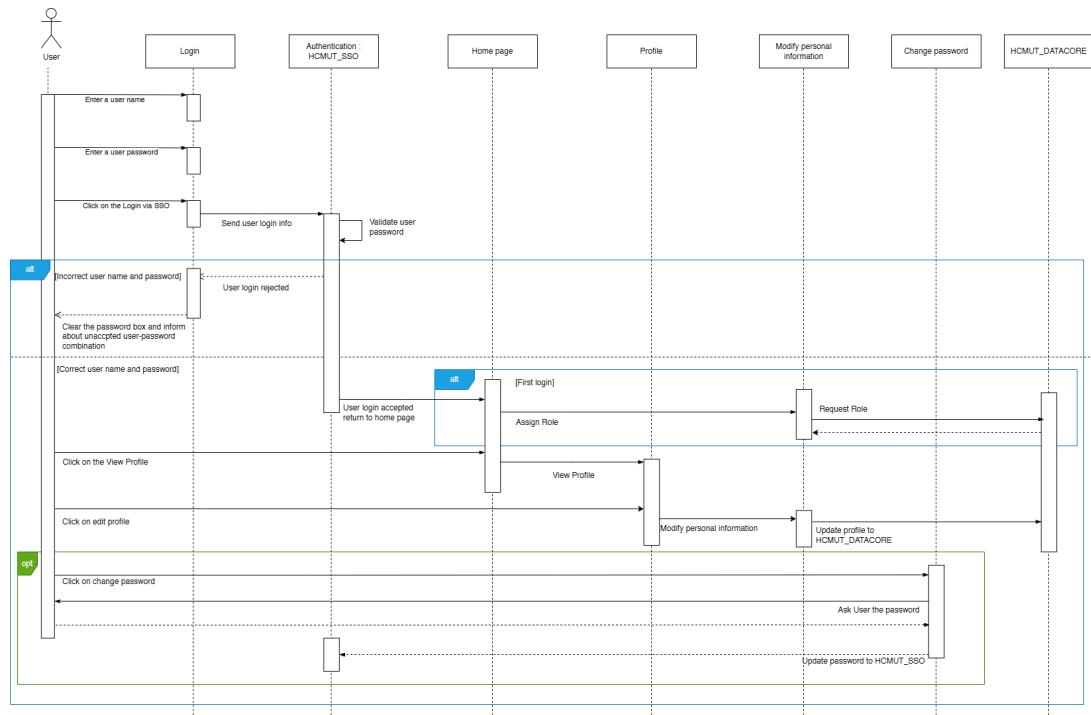
Figure 8: AI-generated review quizzes

<b>Use-case ID</b>	UC-07
<b>Use-case name</b>	AI-generated review quizzes
<b>Use-case overview</b>	Provide students with quizzes related to the courses they are enrolling.
<b>Actors</b>	Students, AI service
<b>Preconditions</b>	<ol style="list-style-type: none"> <li>1. The system is running.</li> <li>2. Internet connection is available.</li> <li>3. AI service must be available.</li> <li>4. The courses must have learning materials uploaded by tutors.</li> </ol>
<b>Trigger</b>	Students use the AI-based quiz generation function.
<b>Steps</b>	<ol style="list-style-type: none"> <li>1. Retrieve uploaded course materials of the course.</li> <li>2. Process and analyze the content with AI.</li> <li>3. Search the internet for related academic resources and quizzes.</li> <li>4. Generate quiz questions covering the key topics.</li> <li>5. Display the quiz to the requested students.</li> </ol>
<b>Postconditions</b>	<ol style="list-style-type: none"> <li>1. The quizzes are displayed on the screen of the requested students, and they can download the quizzes as a document file.</li> <li>2. The quizzes can be available until the end of the login session of the requested students, or until they finished the course if they chose to save the quizzes</li> </ol>
<b>Alternative Flows</b>	<ul style="list-style-type: none"> <li>- If the course doesn't have any learning materials, notify the user and request them for manual typing in key topics needed for review. A1: Invalid login → Access denied with error message.</li> </ul>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. If AI service isn't available, display an error.</li> </ol>

Table 16: Use Case UC-07: AI-generated review quizzes

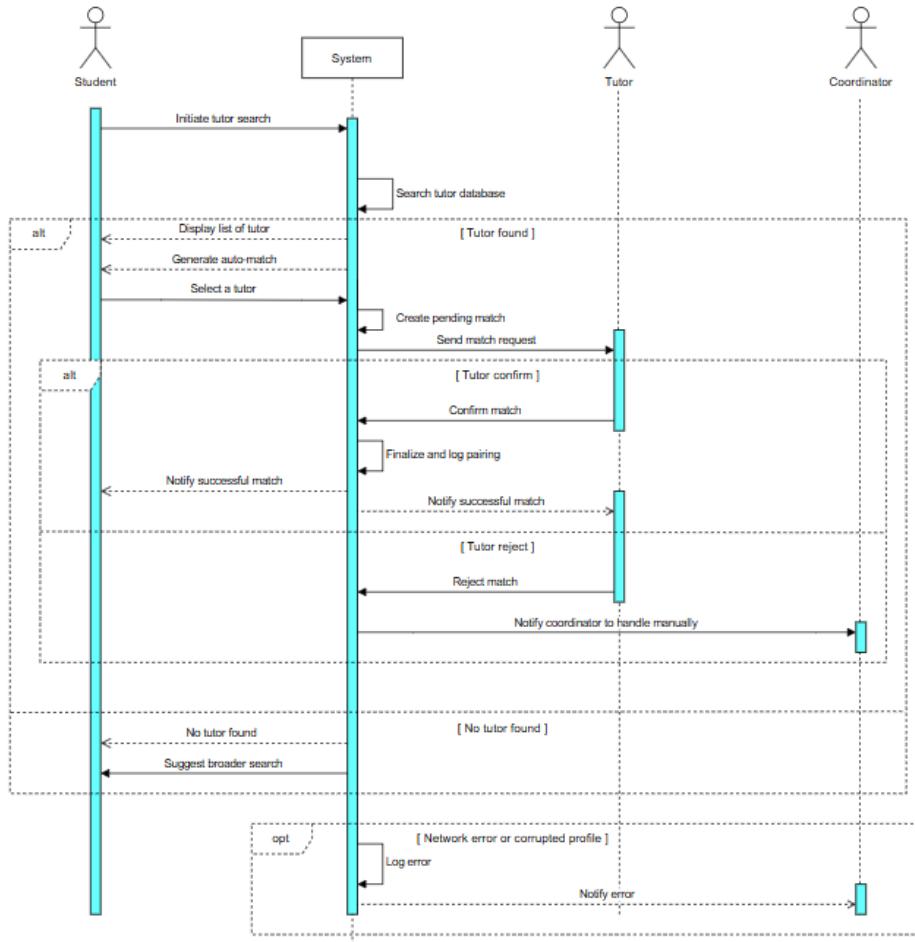
## 7 Sequence Diagram

### 7.1 SQ-01 Log in, Log out & Profile Management



**Figure 9:** Log in, Log out & Profile Management

## 7.2 SQ-02 Tutor-Student Matching



**Figure 10:** Tutor-Student Matching

## 7.3 SQ-03 Session Scheduling Management

Session Scheduling Management

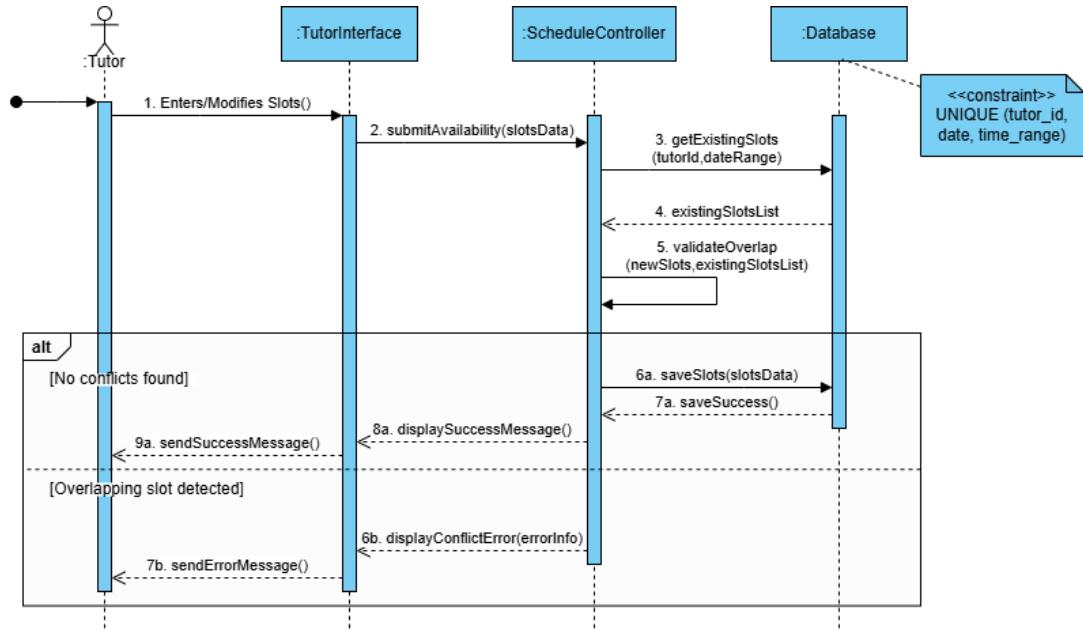


Figure 11: Tutor published available time slots

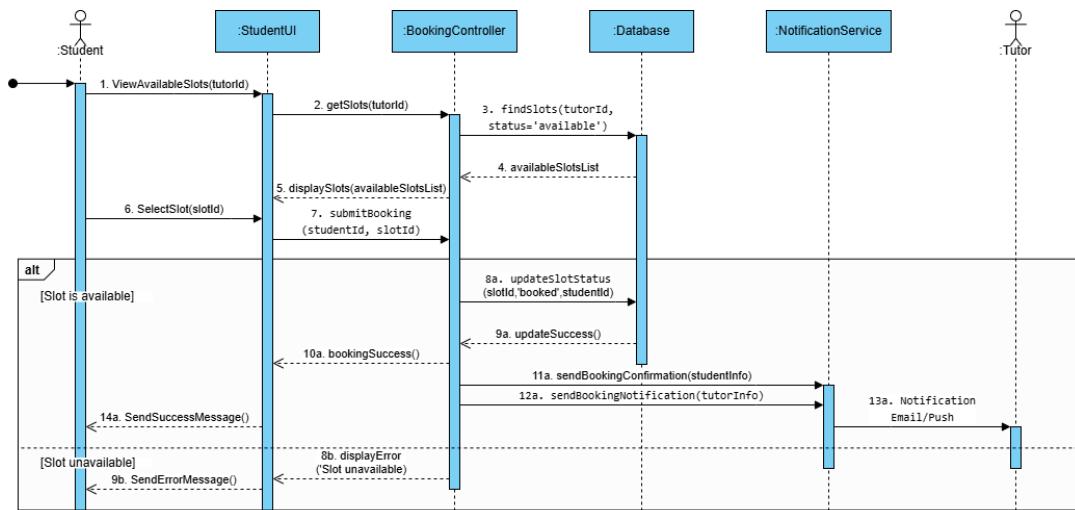


Figure 12: Student view and book session

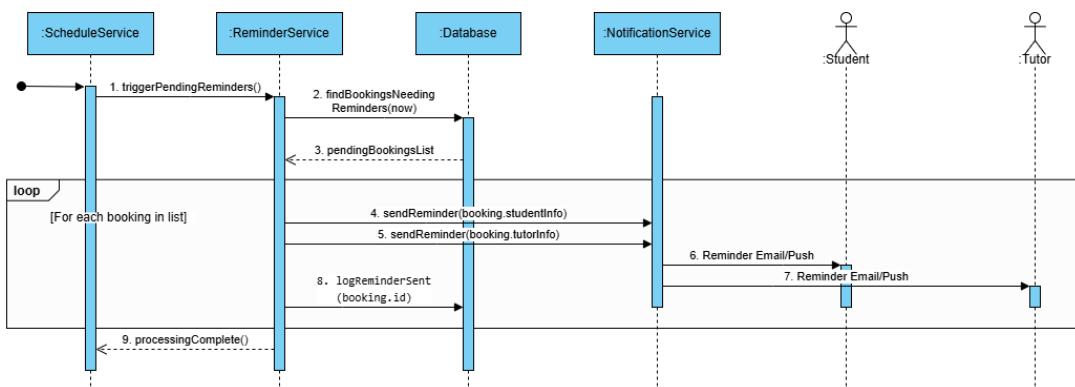
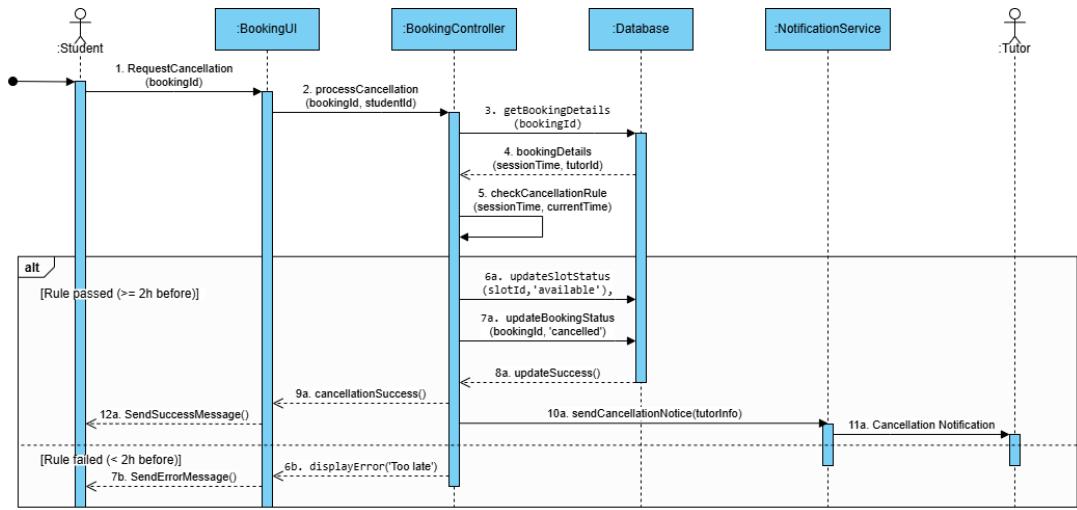


Figure 13: System sends notification reminders



**Figure 14:** Cancellation and rescheduling

## 7.4 SQ-04 Feedback & Progress Tracking

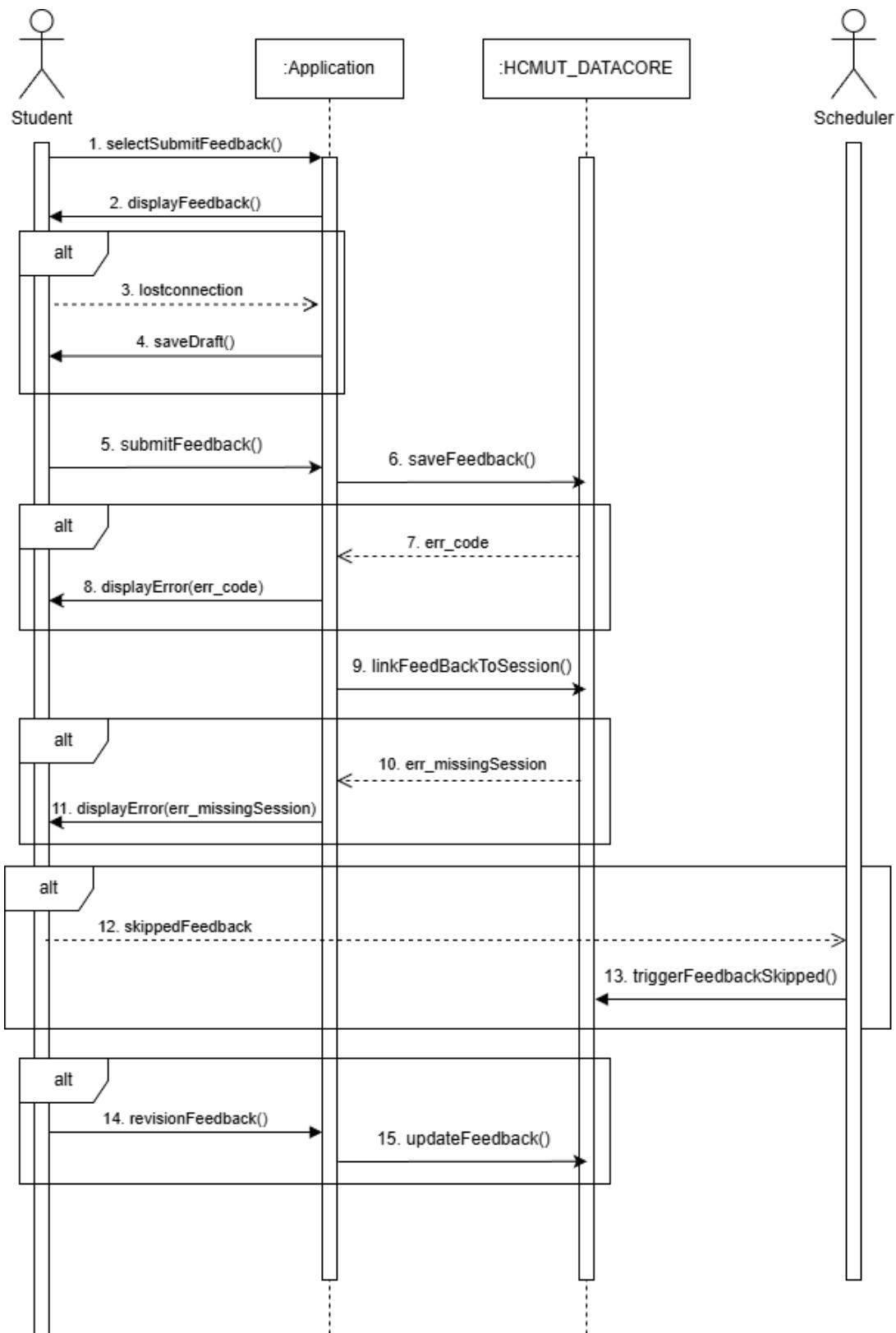
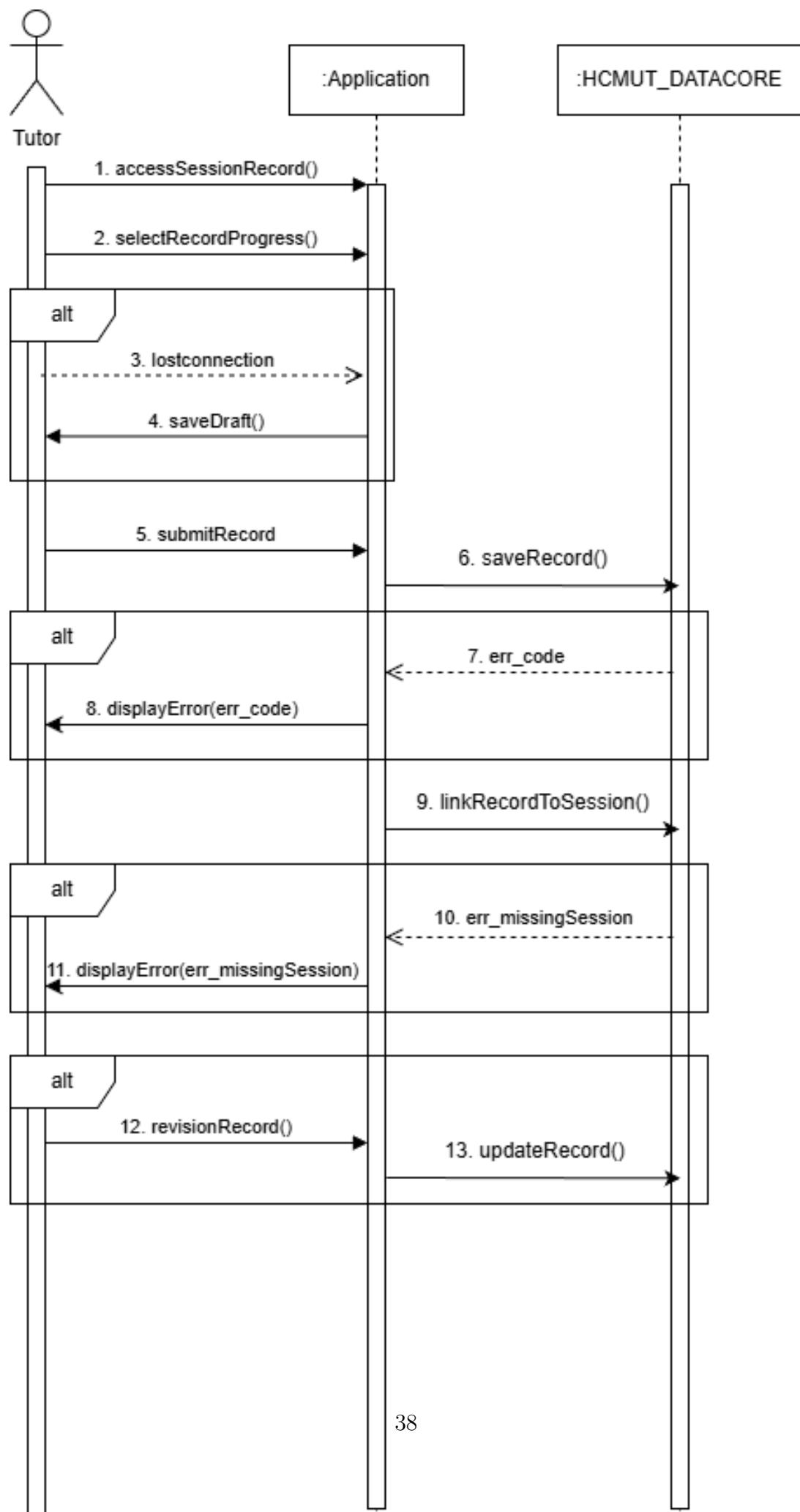
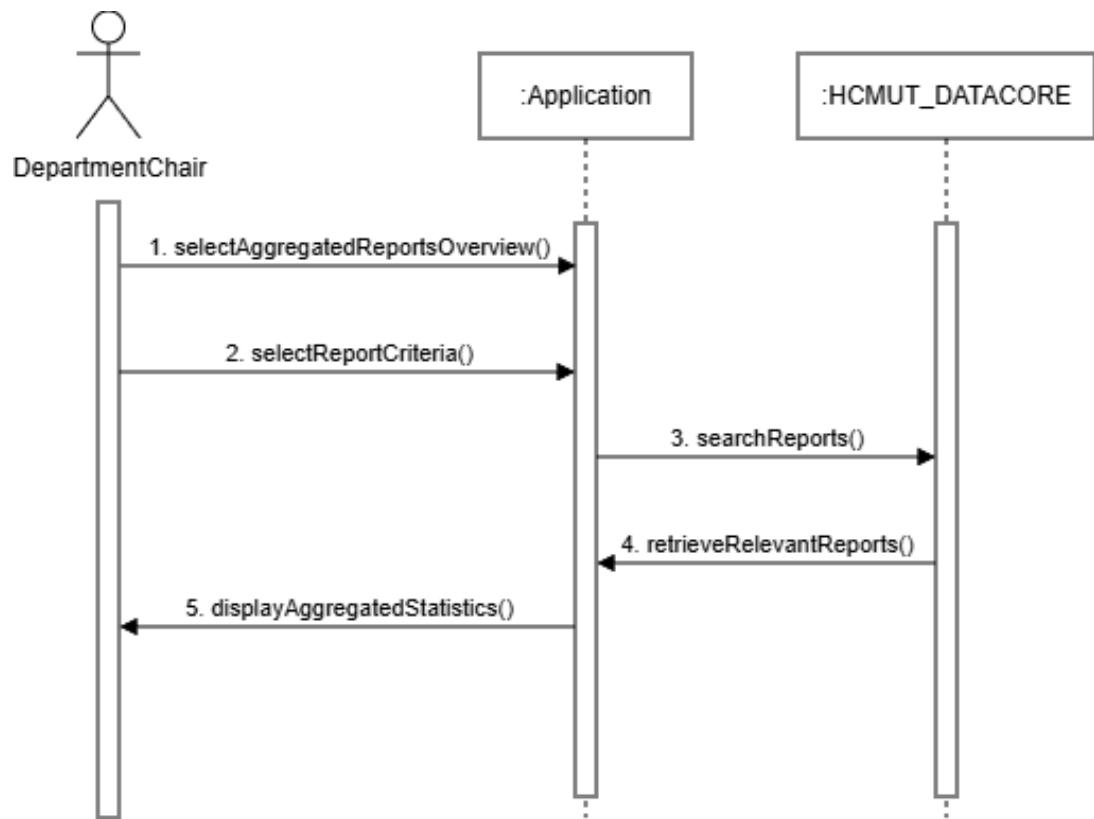


Figure 15: Feedback Submission

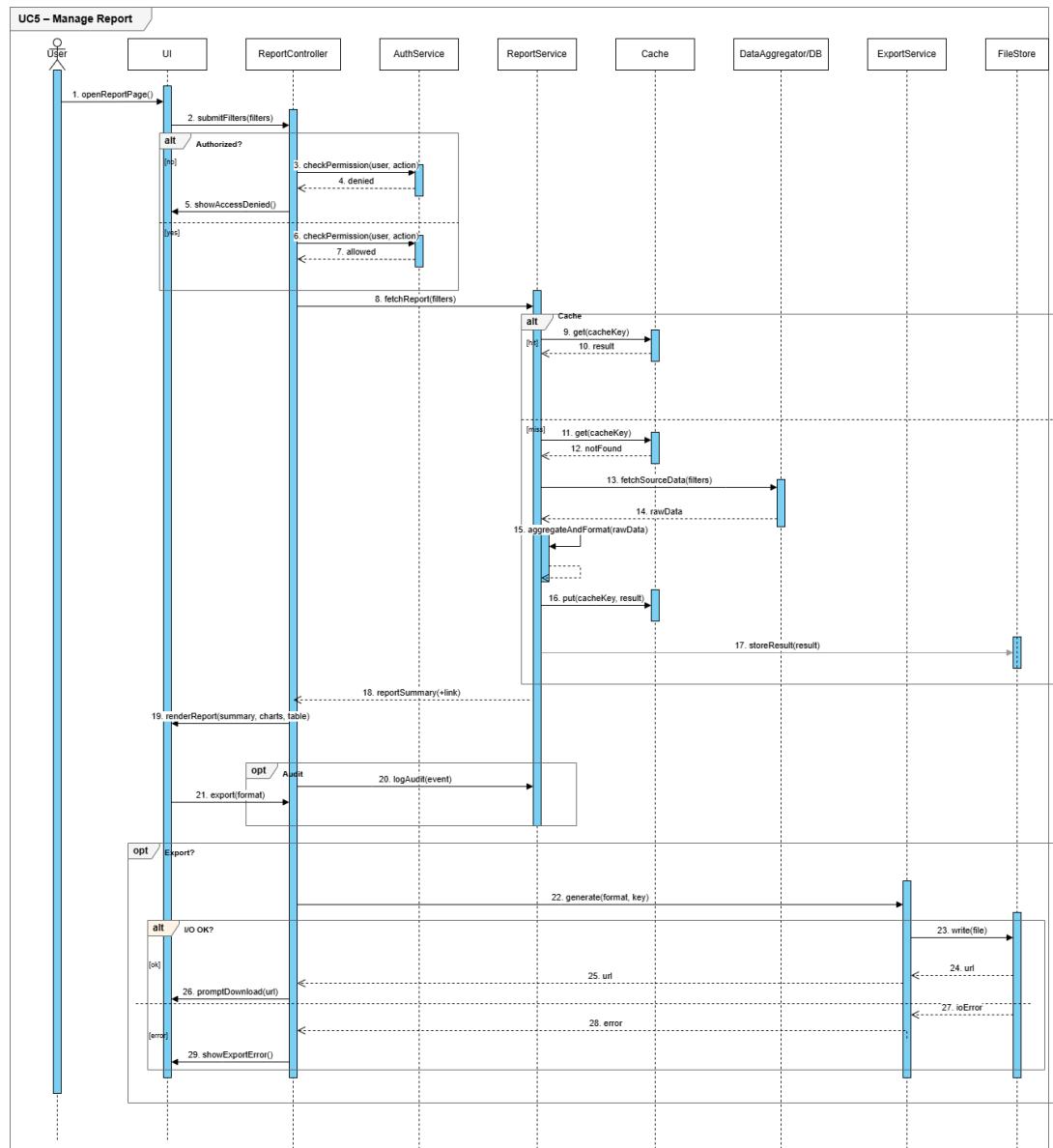


**Figure 16:** Session Recording Access



**Figure 17:** Report Tracking

## 7.5 SQ-05 Reporting & Analytics



**Figure 18:** Reporting & Analytics

## 8 Activity Diagram

### 8.1 AC-01 Log in, Log out & Profile Management

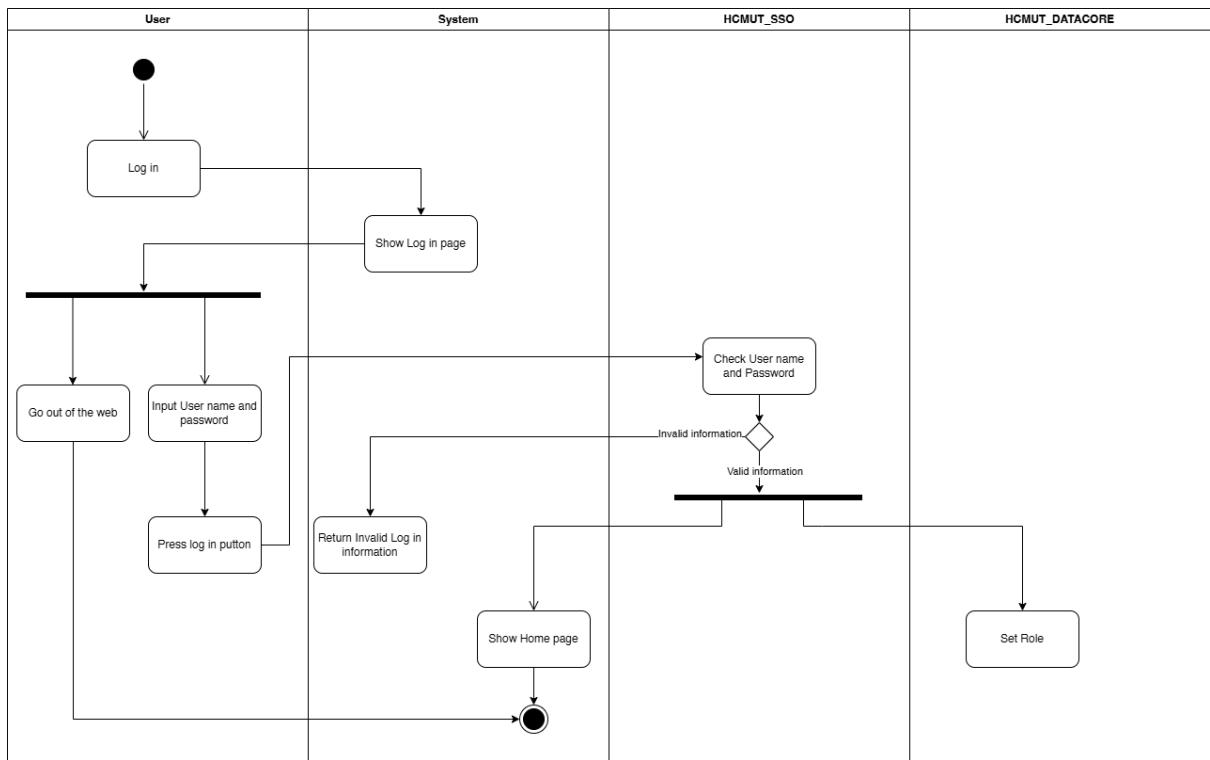
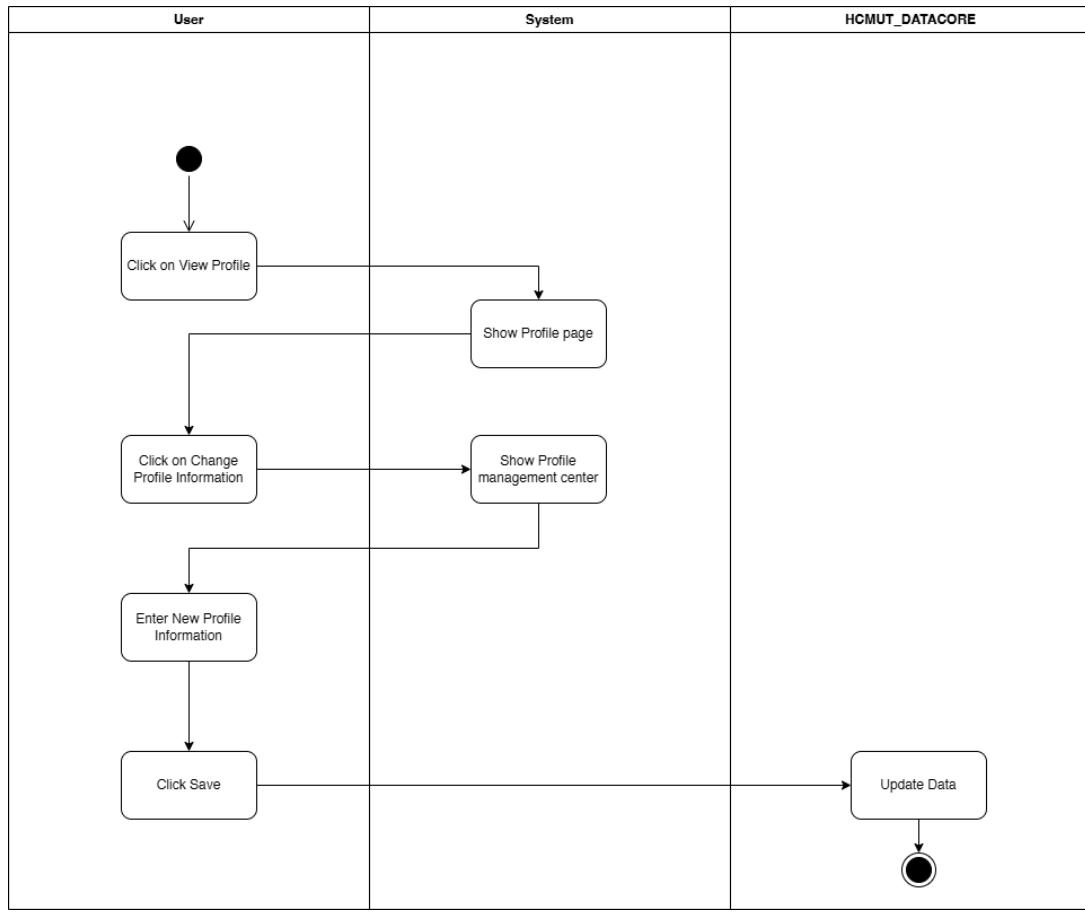
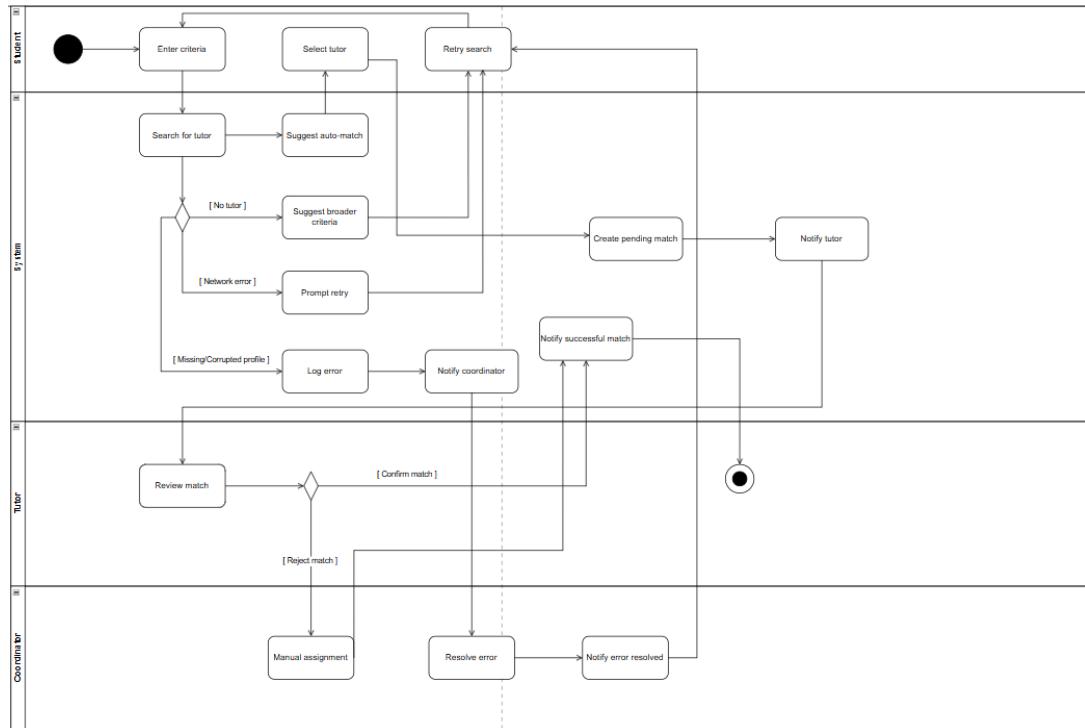


Figure 19: Log in



**Figure 20:** View Profile & Edit Profile

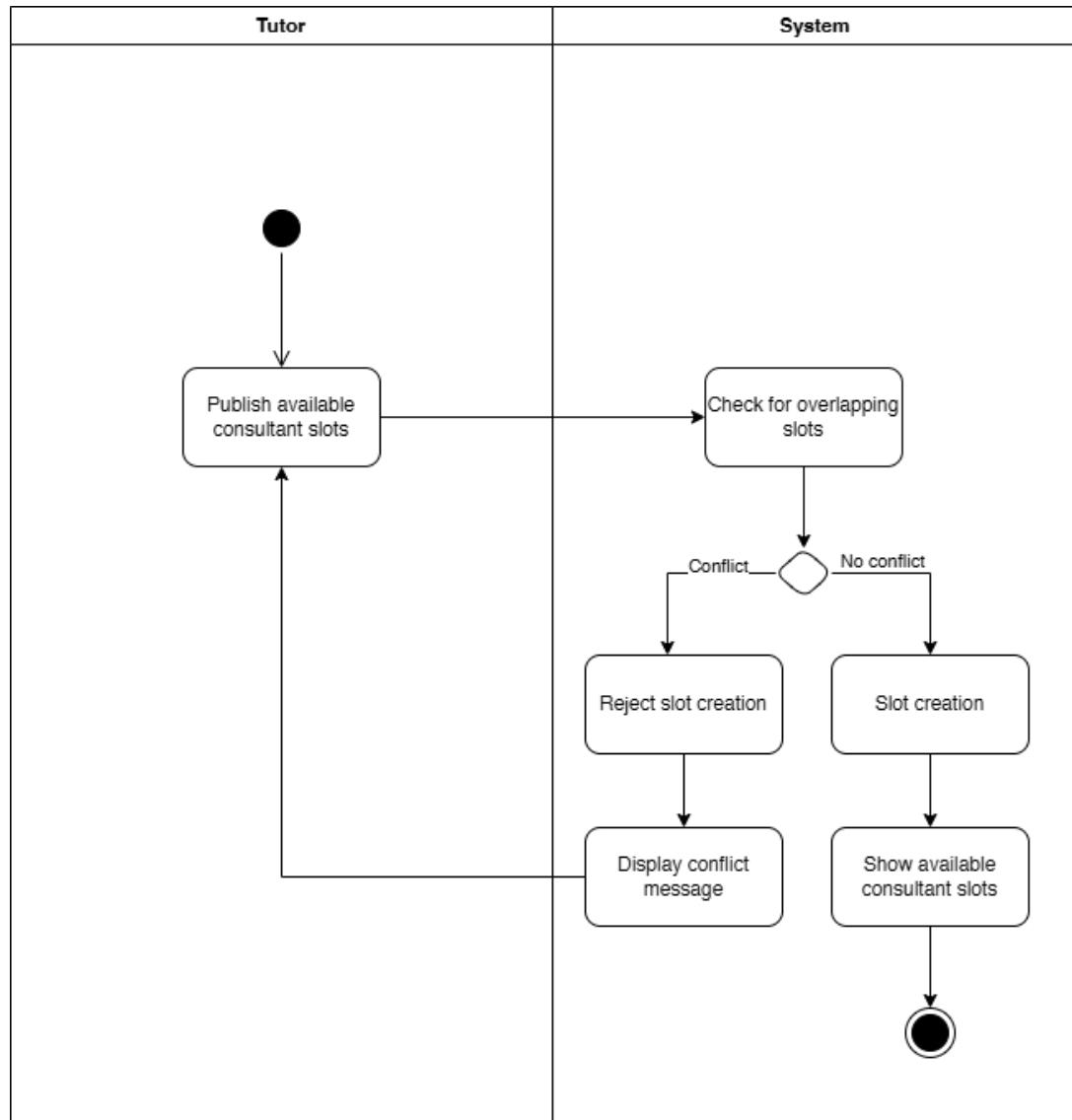
## 8.2 AC-02 Tutor-Student Matching



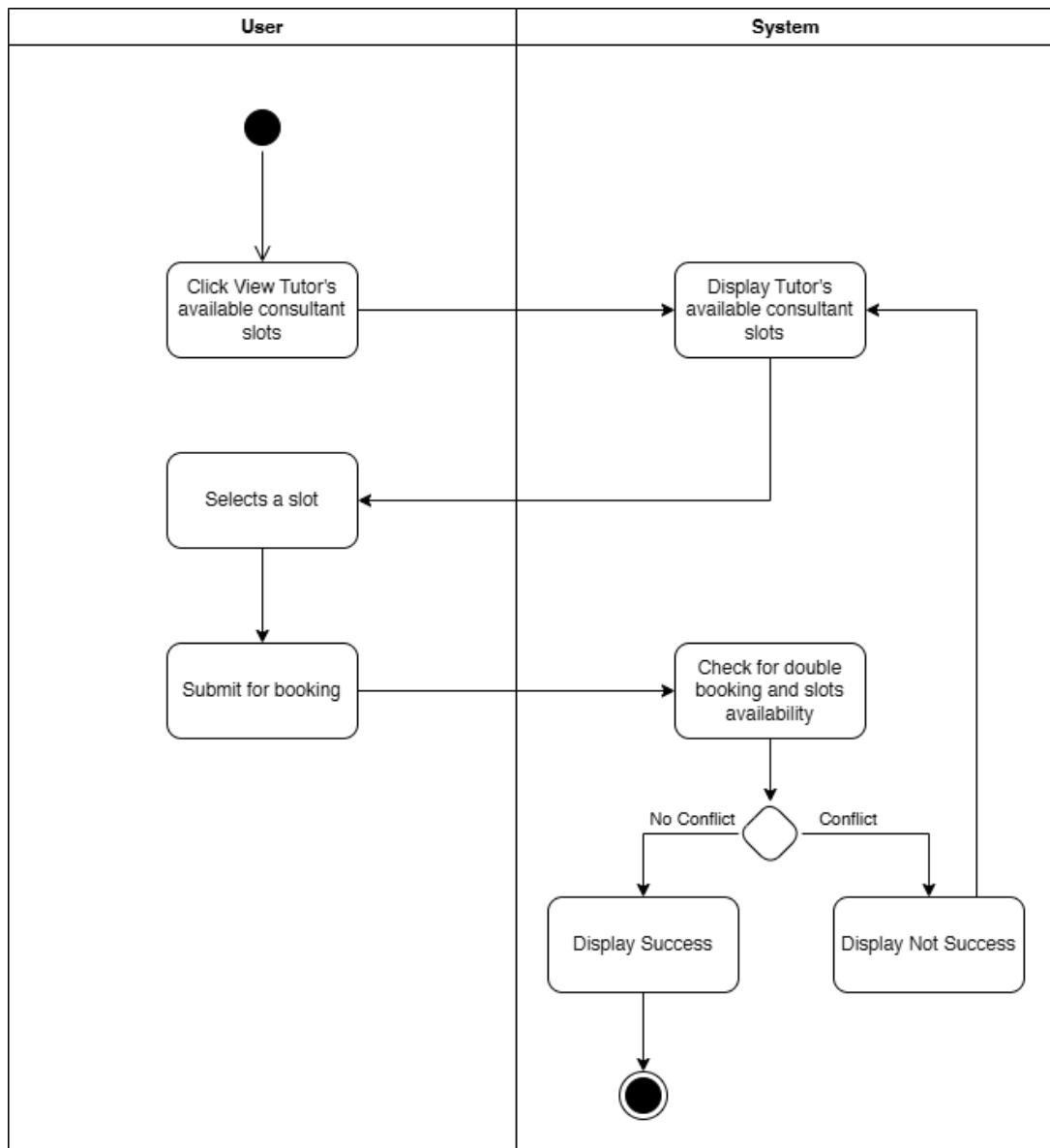
**Figure 21:** Tutor-Student Matching

### 8.3 AC-03 Session Scheduling Management

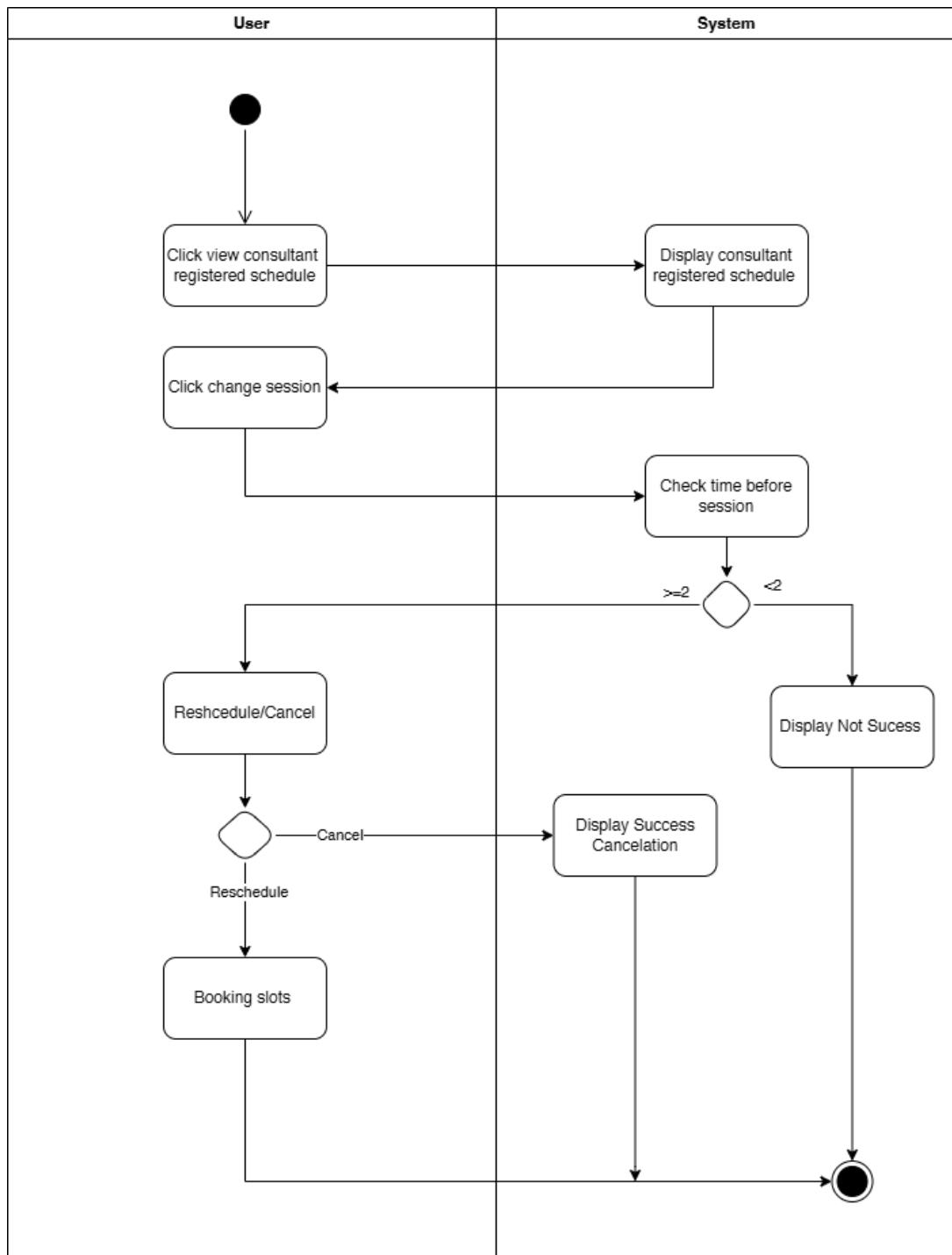
#### Session Scheduling Management



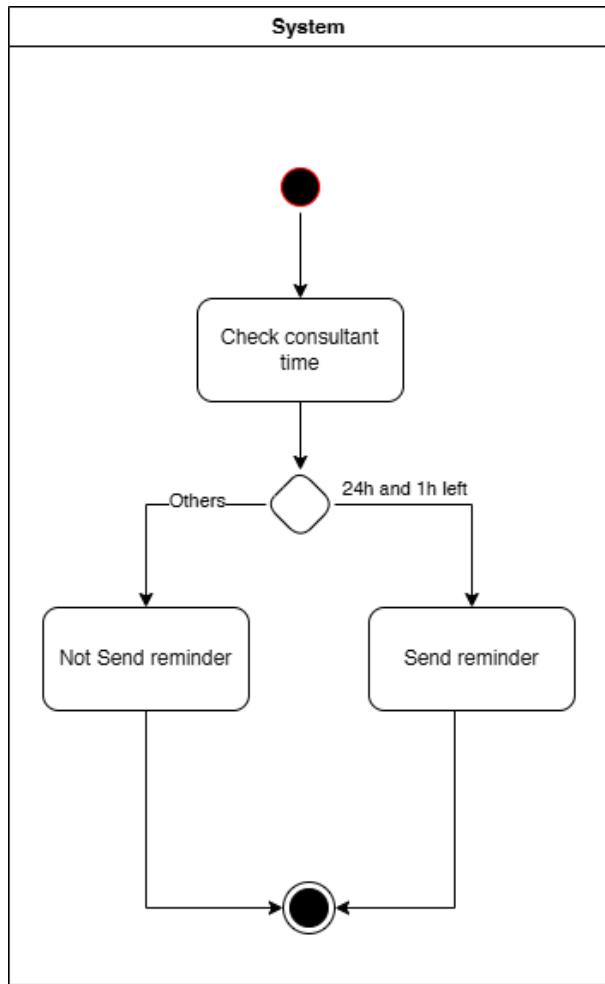
**Figure 22:** Tutor published available time slots



**Figure 23:** Student view and book session

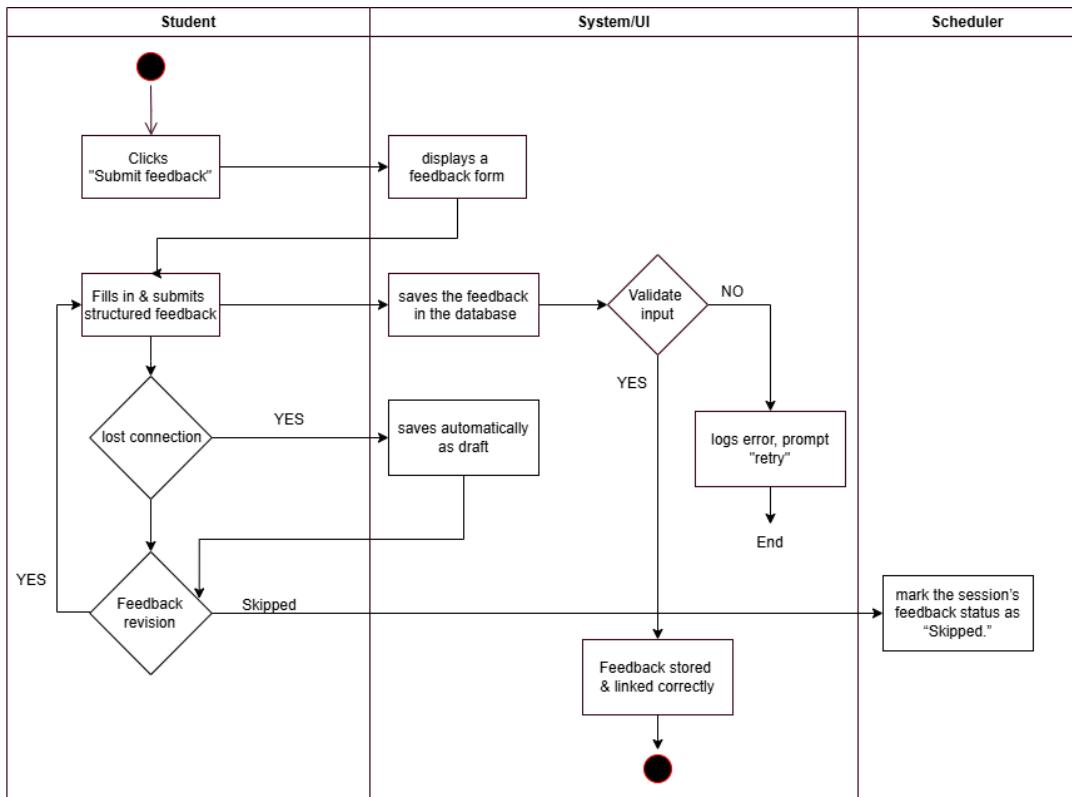


**Figure 24:** Cancellation and rescheduling

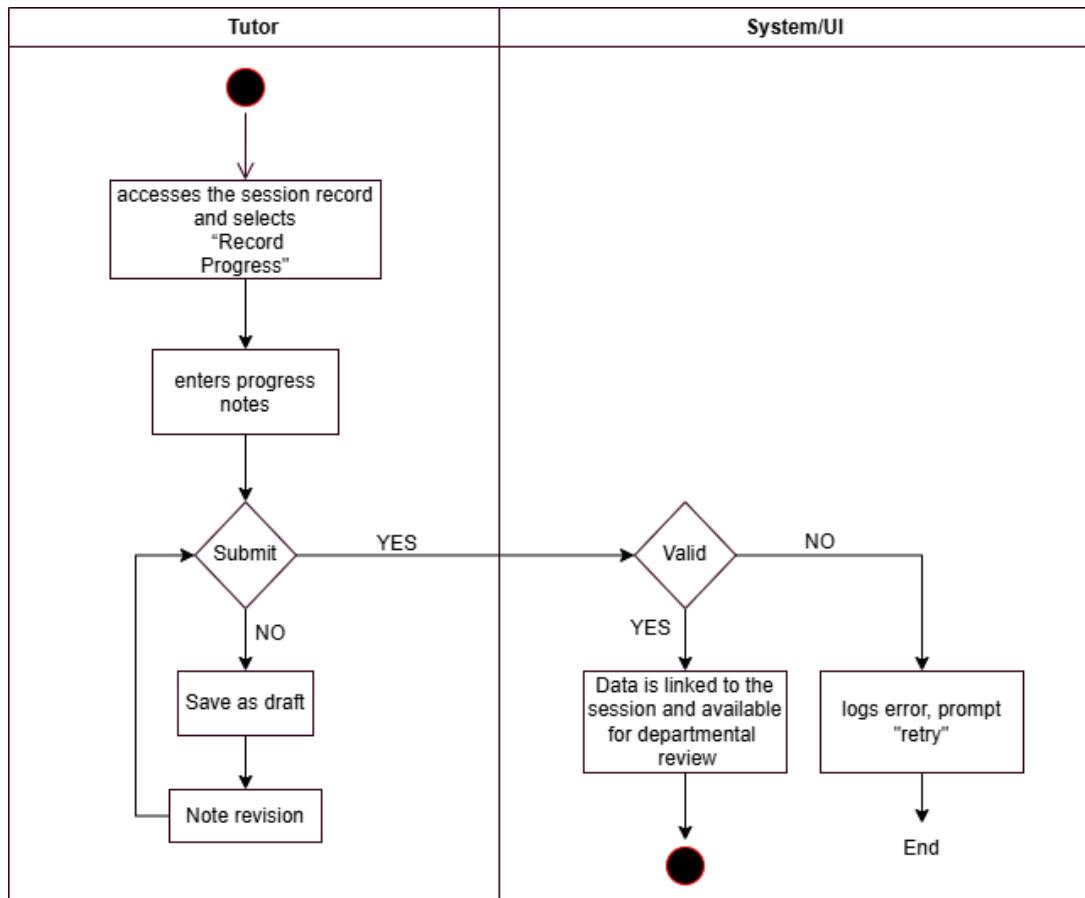


**Figure 25:** System sends notification reminders

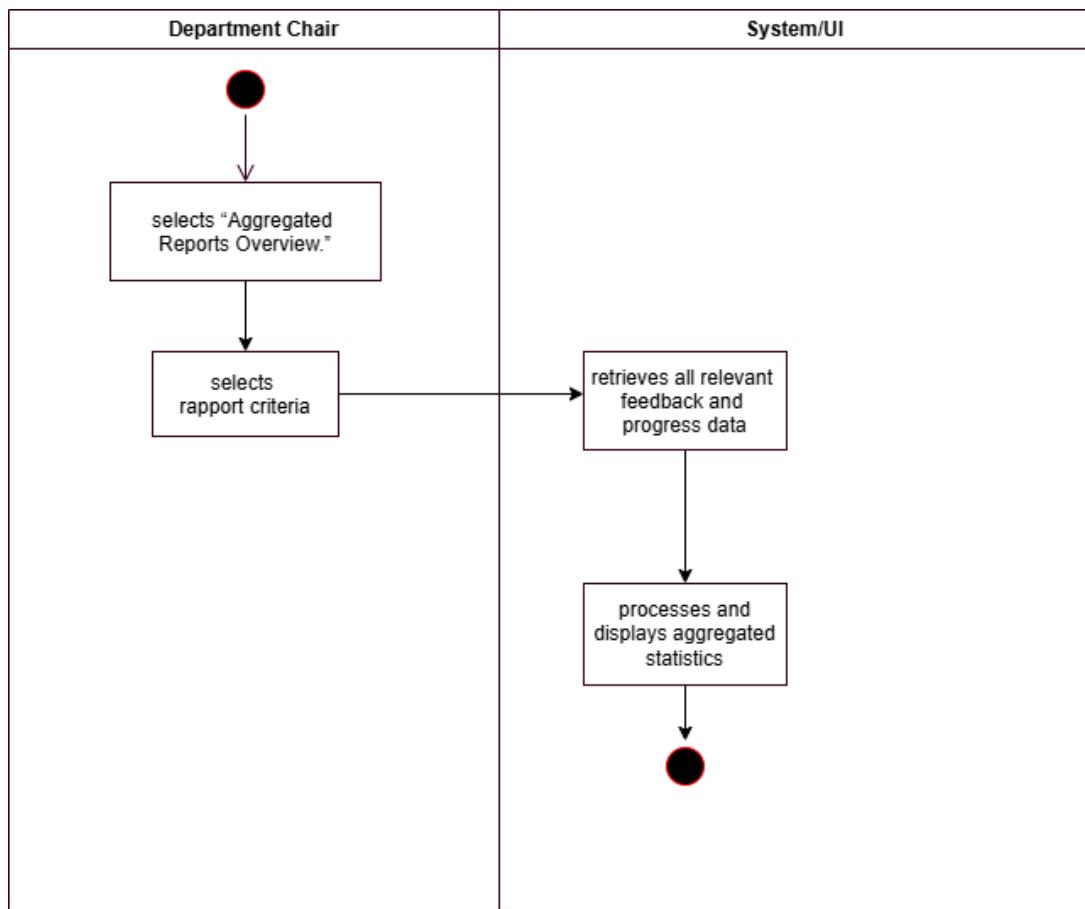
## 8.4 AC-04 Feedback & Progress Tracking



**Figure 26:** Feedback Submission

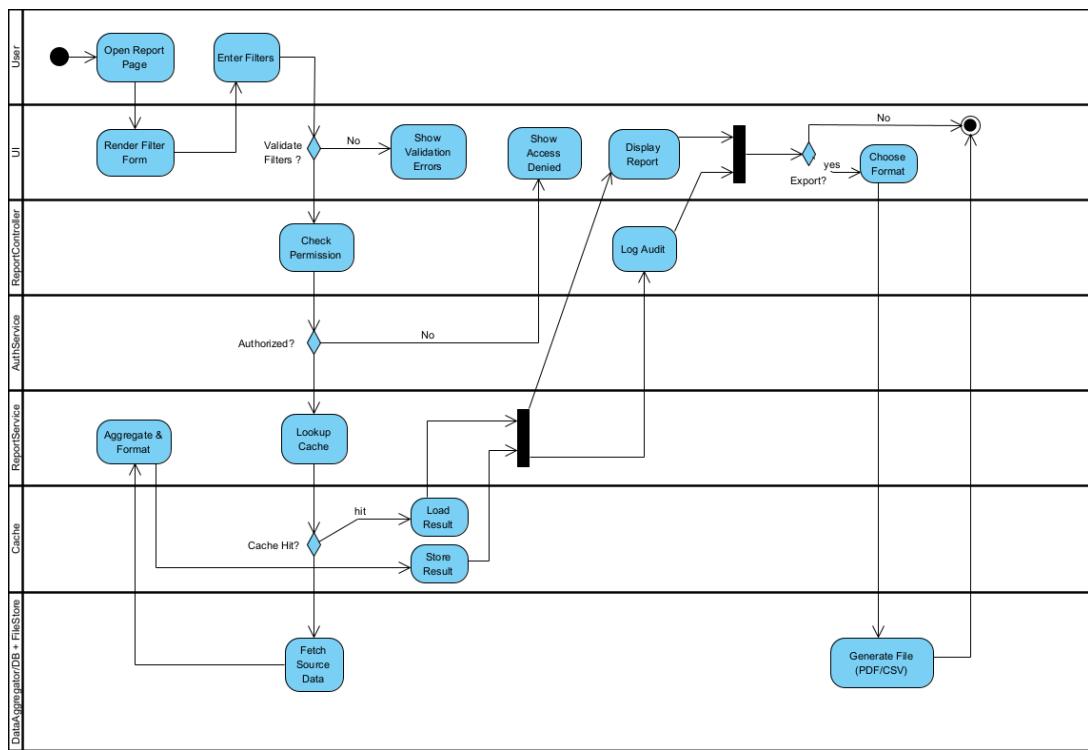


**Figure 27:** Session Recording Access



**Figure 28:** Report Tracking

## 8.5 AC-05 Reporting & Analytics



**Figure 29:** Reporting & Analytics

## 9 State Diagram

### 9.1 SD-01 Log in, Log out & Profile Management

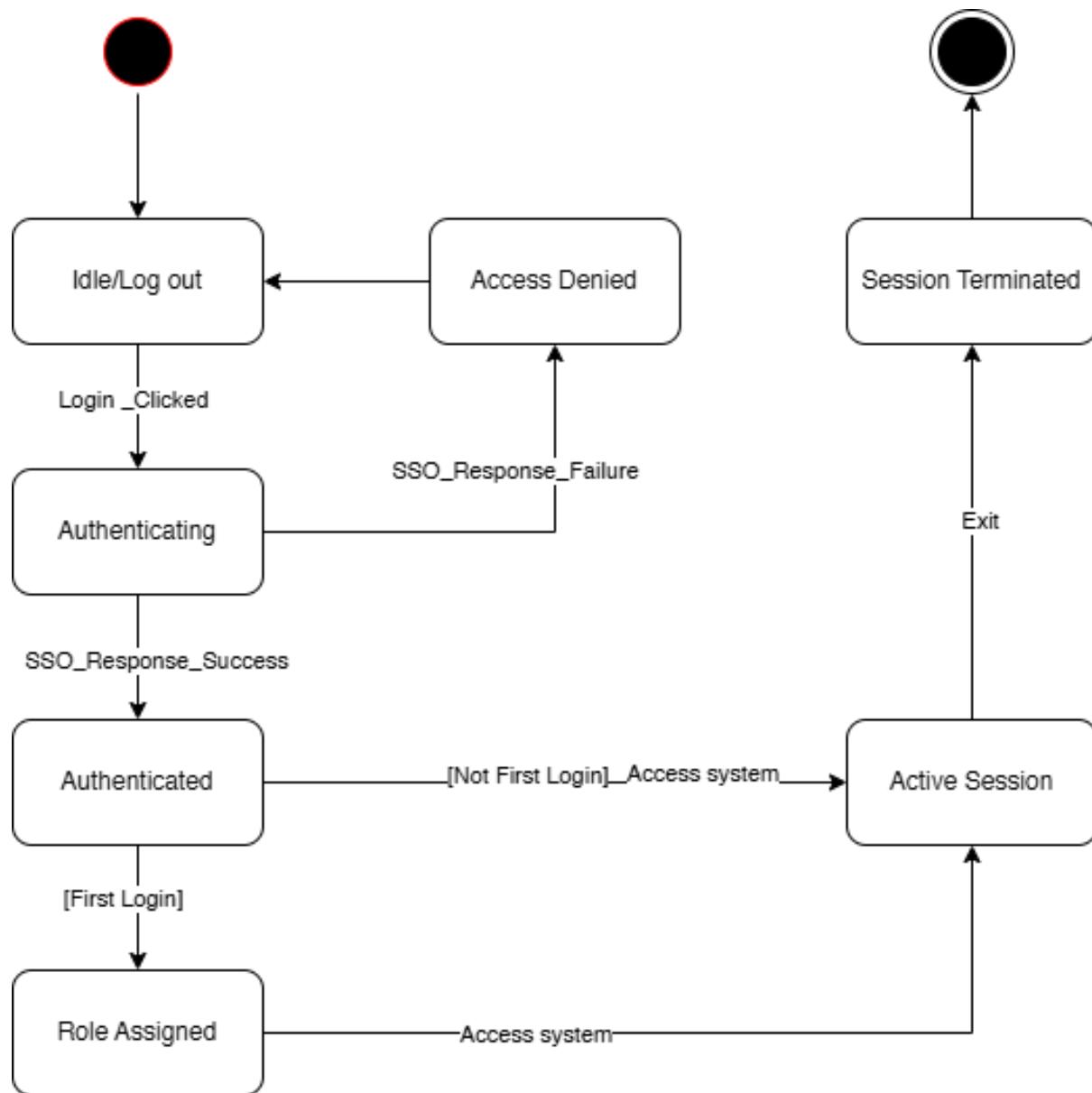
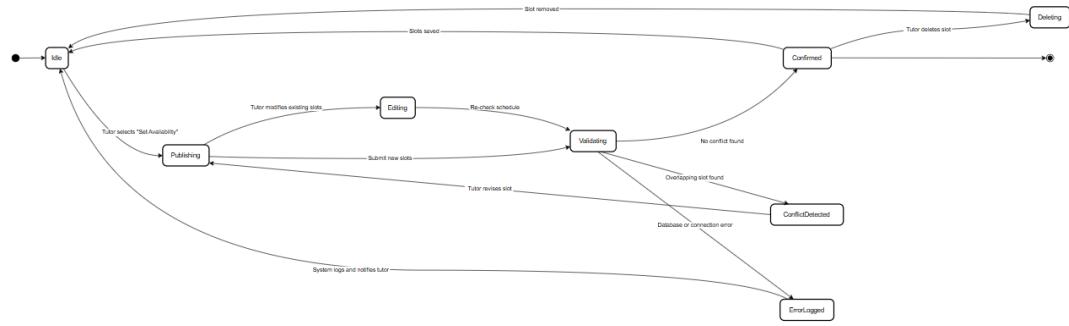


Figure 9: Log in

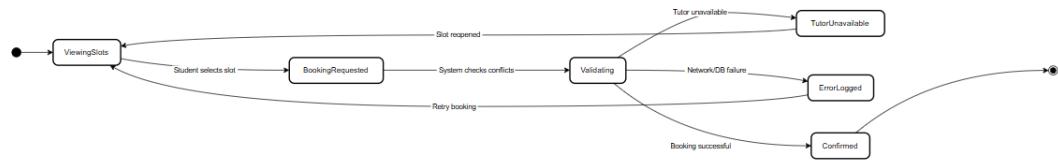
## 9.2 SD-02 Tutor-Student Matching



**Figure 10:** Tutor-Student Matching

## 9.3 SD-03 Session Scheduling Management

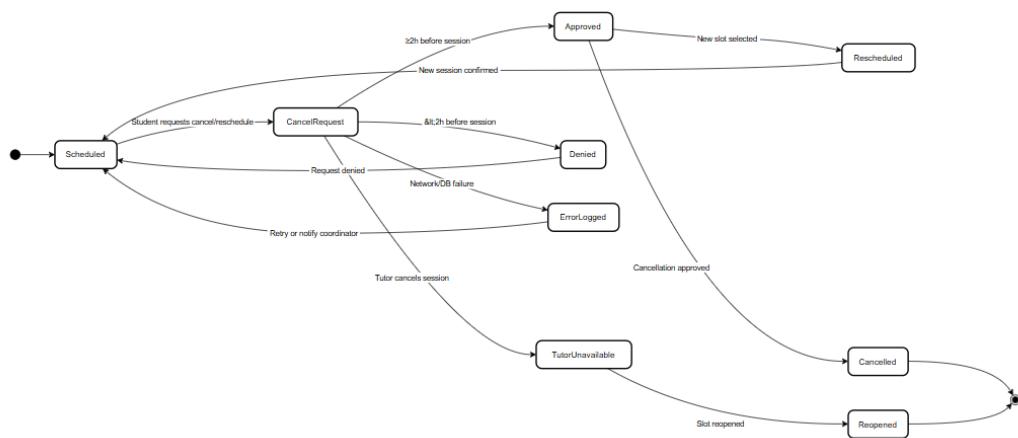
Session Scheduling Management



**Figure 11:** Booking a session

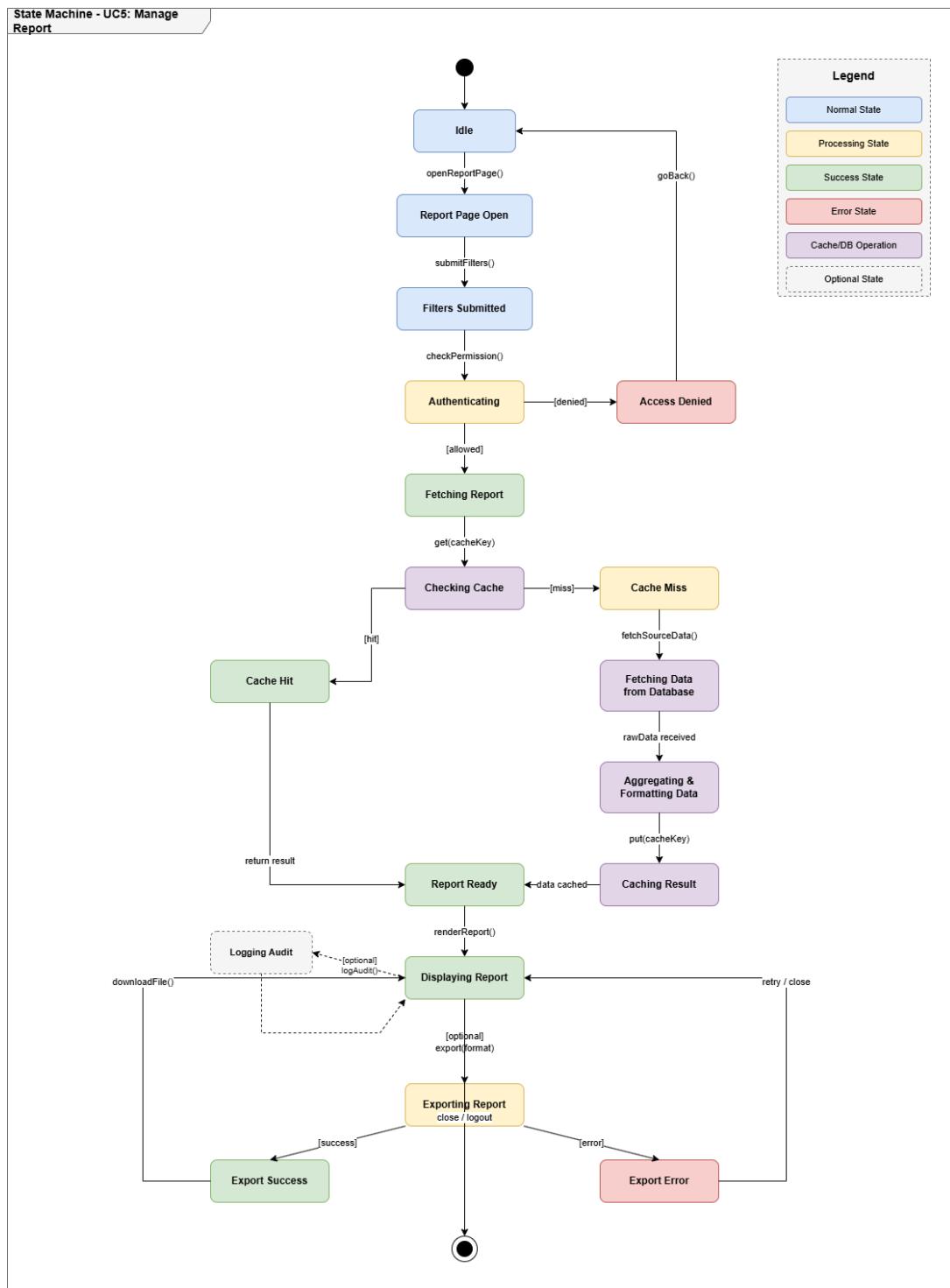


**Figure 12:** System Reminders



**Figure 13:** Cancellation and rescheduling

## 9.4 SD-04 Reporting & Analytics



**Figure 18:** Manage Reports

## 10 Mockup

### 10.1 MU-01 Log in, Log out & Profile Management

The landing page for the Tutor Support System is designed to provide users with a clear overview of its features and benefits. It includes a header with the university logo and navigation links, a main content area with sections for user guides, system integrations, and performance metrics, and a footer with contact information and legal disclaimers.

**Header:**

- TUTOR SUPPORT SYSTEM
- Ho Chi Minh City University of Technology (HCMUT)
- Home About Us Find a Tutor Book a Session Dashboard Community Profile

**Main Content Area:**

**Get the help you need, when you need it.**

Find a tutor, book a session, and track your learning progress — all integrated with HCMUT\_SSO and DATACORE.

**What you can do**

- Browse approved tutors by subject & department
- Smart matching based on availability and course needs
- Book, reschedule, and receive reminders
- View feedback and progress across sessions

**Integration**

Securely integrated with HCMUT\_SSO, DATACORE and Library. Single sign-on lets you access services with one login.

Please exit your browser after using authenticated services for security.

**Technical support**

E-mail: [support@hcmut.edu.vn](mailto:support@hcmut.edu.vn)  
Tel: (84-8) 38847256 - 7204

**About Us – Tutor Support System**

Tutor Support System is an academic support platform for HCMUT students: find suitable tutors, schedule support sessions, track progress and provide quality feedback. The system securely integrates with HCMUT\_SSO, DATACORE and library to ensure a unified experience within the university ecosystem.

**Who uses the system?**

Students	Tutors
<ul style="list-style-type: none"><li>Find tutors, book sessions, track learning progress.</li><li>Receive personalized learning suggestions (AI Personalized).</li><li>Submit feedback after sessions, join Forum/Q&amp;A.</li></ul>	<ul style="list-style-type: none"><li>Manage availability, accept support requests.</li><li>Record progress logs for each student.</li><li>Review feedback, improve teaching quality.</li></ul>
Coordinators	Departments / Admin
<ul style="list-style-type: none"><li>Điều phối tutor, xử lý xung đột/overbook.</li><li>Cấu hình Matching Rules, xem Matching Suggestions.</li><li>Báo cáo Workload/Utilization, theo dõi vấn đề feedback.</li></ul>	<ul style="list-style-type: none"><li>Departmental &amp; Participation reports.</li><li>SSO/Library health, notifications log, export jobs.</li><li>RBAC &amp; audit logs đảm bảo tuân thủ.</li></ul>

**Integrations**

- HCMUT\_SSO
- DATACORE
- Library

**Impact (mock)**

128	3,240
Active tutors	Sessions / term
4.7/5	14
Avg. rating	Programs covered

**Tutor Support System**

Academic support network for HCMUT students.  
Find tutors, book sessions, and get guided learning.  
Securely integrated with HCMUT\_SSO and DATACORE.

**Quick Links**

Find a Tutor  
Book a Session  
Your Dashboard  
Submit Feedback

**Support**

Academic Affairs  
Student Affairs  
Library Resources  
Report an Issue

© 2025 Tutor Support System – Ho Chi Minh City University of Technology (HCMUT)

Figure 9: Landing page

**TUTOR SUPPORT SYSTEM**  
Ho Chi Minh City University of Technology (HCMUT)

**Enter your Username and Password**

**Username**  
student@hcmut.edu.vn

**Password**  
\*\*\*\*\*

**Sign in**

**Languages**

- Vietnamese
- English

**Please note**

The Login page enables single sign-on to multiple websites at HCMUT. This means that you only have to enter your user name and password once for websites that subscribe to the Login page.

You will need to use your HCMUT Username and password to login to this site. The "HCMUT" account provides access to many resources including the HCMUT Information System, e-mail, ...

For security reasons, please Exit your web browser when you are done accessing services that require authentication!

**Technical support**

E-mail: [support@hcmut.edu.vn](mailto:support@hcmut.edu.vn)  
Tel: (84-8) 38847256 - 7204

**Tutor Support System**  
Academic support network for HCMUT students.  
Find tutors, book sessions, and get guided learning.  
Securely integrated with HCMUT\_SSO and DATACORE.

**Quick Links**

- Find a Tutor
- Book a Session
- Your Dashboard
- Submit Feedback

**Support**

- Academic Affairs
- Student Affairs
- Library Resources
- Report an Issue

© 2025 Tutor Support System – Ho Chi Minh City University of Technology (HCMUT)

**Figure 9:** Log in page

**My Profile**  
Update your personal information.

**Account Information**

<b>Full name</b> Nguyen Viet Trung	<b>Student ID</b> 2353xxxx
<b>Program</b> Computer Engineering (OISP)	<b>Department</b> Computer Science & Engineering
<b>Email (HCMUT)</b> 2353xxxx@hcmut.edu.vn	<b>Personal Email</b> trung.nguyen@gmail.com

**Personal Information**

<b>Phone</b> +84 901 234 567	<b>Personal Email</b> trung.nguyen@gmail.com
<b>Short Introduction</b> Computer Science student passionate about web development and AI.	

**Save changes**

**Figure 9:** View profile & Edit profile page

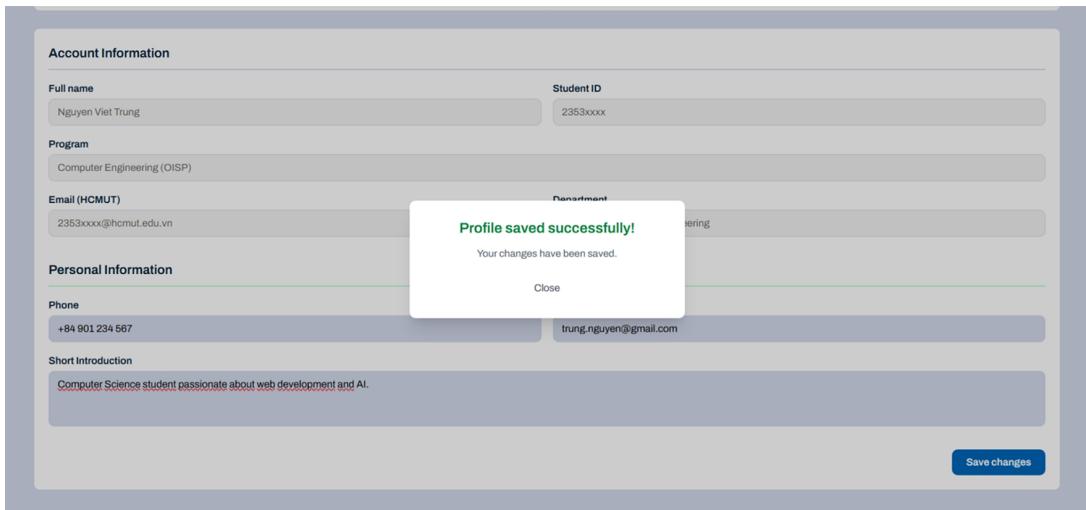


Figure 9: Save change Profile page

## 10.2 MU-02 Tutor-Student Matching

The screenshot shows the 'AI Tutor Match' section of the 'TUTOR SUPPORT SYSTEM'. At the top, there's a navigation bar with links for Learning, Feedback, Community, AI Tools, and Profile.

**AI Tutor Match**

We analyze your subject, schedule, and learning style to recommend the best tutors for you. You can still browse and book manually.

AI Suggestion • Last updated: just now • This does not auto-book.

**Tell us what you need**

FR-ADV01 Intelligent Matching

**Course / Topic**

CO1001 – Programming Fundamentals

Used to filter tutors with matching expertise.

**When can you study?**

Weekdays 18:00 – 21:00

We'll only show tutors who are free in this range.

**Your preferred style (optional)**

Step-by-step explanation + Q&A

Helps rank tutors whose style matches you.

**What are you struggling with?**

Example: I don't understand pointer-to-pointer and recursion stack frames. I freeze during lab check.

We'll use this (privately) to improve the match explanation.

**Generate AI Match**

Prefer to choose manually? [Browse all tutors](#) →

**Suggested Tutors** [Personalized ranking](#)

Top 3 matches based on availability, style, workload

**Nguyen T. A. Match #1**

**EXPERTISE**  
CO1001 - Pointers & Recursion

**NEXT AVAILABILITY**  
Wed 19:00 - Fri 20:00

**STYLE**  
Step-by-step, asks you to explain back

**Workload OK**

Confidence: High

Why we think this is a good match

- Available Wed after 18:00, same as you.
- Recently helped 3 students pass Lab 03 pointer debugging.
- Teaches using "you explain it back", which matches your preferred style.

**Request Session**

or [View profile](#)  
or [See timetable](#)

**Doan A. K. Match #2**

**EXPERTISE**  
Data Structures - Linked Lists

**NEXT AVAILABILITY**  
Sat 09:00 - Sun 10:30

**STYLE**  
Whiteboard simulation, timed questions

**Workload OK**

Confidence: Medium

Why we think this is a good match

- Strong at exam-style drilling under time pressure.
- You said you "freeze during lab check", this tutor focuses on confidence under pressure.
- Weekend morning slots match your "weekends morning" preference.

**Request Session**

or [View profile](#)  
or [See timetable](#)

**Truong Q. T. Match #3**

**EXPERTISE**  
Systems / Debugging live code

**NEXT AVAILABILITY**  
Fri 21:00 (online only)

**STYLE**  
Hands-on screen share & live fix

**High Load**

Confidence: Medium

Why we think this is a good match

- Specializes in debugging C code under real conditions.
- Prefers remote / live share — matches "lab debugging together".
- Warning: workload is high, session acceptance may take longer.

**Request Session**

or [View profile](#)  
or [See timetable](#)

FR-ADV01 Intelligent Matching: Ranked suggestions with explanation - User can still choose manually

Figure 10: AI Tutor-Student Matching page

The screenshot shows the 'Find a Tutor' section of the Tutor Support System. At the top, there is a search bar with placeholder text 'e.g. CO1001, Calculus I', a dropdown for 'Availability' set to 'Any time', and a dropdown for 'Department' set to 'All Departments'. Below the search bar are three tutor profiles:

- Nguyen T. A.**: High match - 82%.  
Senior student - CSE  
CO1001 - Programming Fundamentals  
Computer Science and Engineering  
Next available:  
Wed 14:00 - Online / B4-205 (2 left) | Fri 09:30 - Online (1 left)  
Status: Available  
Book session | View profile
- Pham Q. T.**: Good match - 74%.  
Tutor - Applied Math  
MA1001 - Calculus I  
Applied Mathematics  
Next available:  
Thu 09:00 - C2-301 (2 left) | Sat 10:15 - Online (no)  
Status: Available  
Book session | View profile
- Truong Q. T.**: Available soon.  
Tutor - EEE  
EE2002 - Digital Systems  
Electrical & Electronics Engineering  
Next available:  
Fri 16:30 - Lab D1 (1 left)  
Status: 1 slot this week  
Book session | View profile

**Figure 10:** Find a Tutor page

**TUTOR SUPPORT SYSTEM**  
COORDINATOR

Operations Tutors Students Reports

### Coordinator Assignment

Manually assign a tutor to a student. This will override any previous or pending matches. Only Coordinator / Dept Chair / Admin can do this. (FR-MAT.04)

- Assignment is logged with your coordinator ID. • Student and tutor will receive notifications.

**Student Information** Student

Student ID	2362525	Full name (from DATACORE)	Nguyen Manh Quoc Khanh
Search or enter the student who needs tutoring support.		Read-only from DATACORE.	
Faculty / Major	Computer Science and Engineering	Requested Support In	Programming Fundamentals (CO1001)
Course or skill area the student needs help with.			

**Tutor Selection** Tutor

Tutor	Nguyen T. A. · CO1001 · CS Faculty · 3 mentees
Pick a tutor. Their current workload and subject expertise is shown.	
Earliest Available Slot	Wed · 14:00 · B4-205
Pulled from tutor availability (FR-SCH.01).	
Coordinator Note / Reason	Urgent support before midterm; previous tutor is at capacity.
This reason will be logged in audit, visible to department chairs.	

**Override Policy**

- This assignment will override any existing pending match.
- Both student and tutor will receive notifications.
- This action is recorded with your Coordinator ID and timestamp.

**Assignment Summary**

Draft - Not saved FR-MAT.04

Student	2362525 — Nguyen Manh Quoc Khanh Computer Science and Engineering
Focus Course	CO1001 — Programming Fundamentals
Tutor	Nguyen T. A. · CO1001 · CS Faculty · 3 mentees
Earliest Slot	Wed · 14:00 · B4-205 / Online
Coordinator Reason	Urgent support before midterm; previous tutor is at capacity.

**Assign Now**

By assigning, you confirm this pairing is appropriate and acknowledge it will be logged.

HOMUT Tutor Support System · Coordinator View · Manual override of tutor-student match

**Figure 10:** Coordinator assignment page

The screenshot shows a "Smart Match Suggestion" page from the Tutor Support System. It displays three identical profiles for a tutor named Nguyen T. A., who is teaching Programming Fundamentals (CO1001) at the Faculty of Computer Science. Each profile has a matching score of 98%. The profiles include sections for Availability Fit, Style & Focus, and Student Feedback. Both Availability Fit and Style & Focus mention a preference for "Wednesday - 14:00 (B4-205 or Online)" and "Afternoon / On campus". The Student Feedback section notes a "High clarity rating from first-year students who struggled with pointers." At the bottom of each profile are "Request This Tutor" and "View Tutor Profile" buttons.

The footer navigation bar includes links for "Tutor Support System", "Quick Links" (Find a Tutor, Book a Session, Your Dashboard, Submit Feedback), and "Support" (Academic Affairs, Student Affairs, Library Resources, Report an Issue). The footer also contains a copyright notice: "© 2025 Tutor Support System - Ho Chi Minh City University of Technology (HCMUT)".

**Figure 10:** Smart match suggestion page

### 10.3 MU-03 Session Scheduling Management

#### Session Scheduling Management

The screenshot shows the "Tutor Availability Setup" page. It displays a grid of weekly availability slots for Monday through Friday. Monday has two slots: "09:00 – 10:30 Offline" and "14:00 – 15:30 Offline". Tuesday has 0 slots. Wednesday has one slot: "13:30 – 15:00 Offline". Thursday has 0 slots. Friday has one slot: "09:00 – 10:30 Online". Below the grid is a "Add new slot" form with fields for Day (dropdown menu), Start Time (10:30 SA), End Time (12:00 CH), and Status (Online dropdown). A blue "+ Add Slot" button is next to the status field. At the bottom, a note states: "Your changes will be synchronized with HCMUT\_DATACORE. Students will only see available slots not conflicting with your official timetable." A "Save availability" button is located at the bottom right.

**Figure 11:** Tutor published available time slots

**Session Details**

Tutor must have published an available slot before booking.

**Student Name / ID**  
Nguyen M. Q. Khanh · 2352525

**Choose Time Slot**  
Wed 14:00 - Online / B4-205

**Mode**  
In-person at campus

**What do you want to work on?**

**Heads up**  
You already have a session near this time. You can still continue, but system may warn about back-to-back sessions.

By clicking "Request Session", the system will hold this slot, notify the tutor, and send reminders (24h & 1h before).

**Booking Summary**

Draft · Not submitted

**Tutor**  
Nguyen T. A.  
CO1001 – Programming Fundamentals

**Selected slot**  
Wed 14:00 - Online / B4-205

**Mode**  
In-person at campus

**Goal for session**  
— (no note)

**Policy**

- Reschedule/cancel ≥ 2h before start.
- System prevents double-booking of the same slot.
- Notifications sent to student & tutor automatically.

Figure 12: Student book session page

**Upcoming & Pending**

Your next bookings, including those waiting for tutor approval.

**Wed - 14:00 - 15:30 - Room B4-205 / Online**

**Tutor**  
Nguyen T. A.  
Programming Fundamentals (CO1001)

**Mode**  
In-person or Online

**Status**  
Tutor accepted · Scheduled

**Your request to tutor**  
I need help with recursion and pointer debugging from lab 03. I'm getting segmentation faults.

**Reschedule**

**Cancel Session**

Can reschedule / cancel up to 2h before start (FR-SCH.03).

**Fri - 09:00 - 10:30 - Online**

**Tutor**  
Doan A. K.  
Data Structures

**Mode**  
Online only

**Status**  
Waiting · You're in queue

**Your request to tutor**  
I need a whiteboard-style walkthrough of linked lists. Please test me after each step.

**Awaiting Tutor Confirmation**

**Cancel Request**

Can reschedule / cancel up to 2h before start (FR-SCH.03).

Figure 13: Cancellation and rescheduling page

**Notifications & reminders**

Your system messages, reminders, and alerts.

**Reminder**  
Your session #S-2002 starts in 2 hours.  
Today 09:33

**Feedback posted by tutor for session #S-1994**  
Yesterday 13:01

**Scheduled update**  
CO1001 office-hour moved to Wed 15:30.  
Yesterday 09:15

Figure 14: System sends notification reminders

The screenshot shows the 'My Session' section of the Tutor Support System. It displays two rows of sessions:

- Upcoming & Pending:**
  - Wed - 14:00 - 15:30 - Room B4-205 / Online**
  - Tutor: Nguyen T. A.  
Mode: In-person or Online  
Status: Confirmed / Reminder
- Fri - 09:00 - 10:30 - Online**
- Tutor: Nguyen T. A.  
Mode: In-person or Online  
Status: Tutor accepted - Scheduled  
Action: Awaiting Tutor Confirmation

**Completed Sessions:**

- Wed - 14:00 - 15:30 - Room B4-205 / Online**
- Tutor: Nguyen T. A.  
Mode: In-person or Online  
Status: Needs Feedback  
Action: Submit Feedback

**Fri - 09:00 - 10:30 - Online**

- Tutor: Nguyen T. A.  
Mode: In-person or Online  
Status: Tutor accepted - Scheduled  
Action: View Session Summary

Figure 14: My registered sessions page

The screenshot shows the 'Session Detail' page for a specific session. It includes the following sections:

- Session Information:**
  - Date & Time: Wed - 14:00 - 15:30
  - Location / Mode: Room B4-205 (on campus) or Online (via Google Meet)
  - Tutor: Nguyen T. A.  
Faculty of Computer Science  
"We go through your code step by step."
  - Status: Confirmed by tutor  
Reminder already sent to you
- Your Request / Goal for this Session:**

I need help with recursion and pointer debugging from lab 03. I keep getting segmentation faults and I don't understand stack frames.
- Tutor Notes / Session Summary:**

We'll walk through your code together. You will explain each pointer manipulation line-by-line. We'll also prepare 2 short "exam-style" recursion questions.
- Cancellation Policy:**

You can cancel or reschedule this session up to 2 hours before start. After that, last-minute cancellations may be recorded for review by the coordinator.
- Actions:**
  - Reschedule / Cancel:** Move this session or cancel it if you can't attend. Must be > 2h before start.
    - Reschedule Session
    - Cancel Session
  - After the Session:**

When this session is completed, you'll be asked to submit feedback about the tutor's performance. If you don't respond in time, it will be marked "Feedback Skipper".
  - Submit Feedback:**

Figure 14: Session details page

## 10.4 MU-04 Feedback & Progress Tracking

**Submit Feedback**

This feedback will be linked to your tutoring session and used for quality improvement. Only aggregated results are shared with departments.

**Session Summary**

Mon · Oct 27 · 09:00 – 10:30 · C2-301  
Tutor: Pham Q. T. · Focus: Midterm-style timed drills  
Your goal (from booking): "I keep getting segmentation faults and I don't understand stack frames."

**Overall helpfulness**  
5 - Extremely helpful

**Clarity of explanation**  
Very clear

Did you understand the concepts better?

This is used in tutor quality reports.

**What helped you most?**  
Example: They made me trace pointer values step by step and explain out loud, which made it click.

We may quote this (anonymized) to improve tutor training.

**Anything we should improve for next time?**  
Example: I wish we had 15 more minutes to finish the last recursion question.

If you report serious issues (behavior, respect, safety), coordinators will be alerted.

**Save Draft** **Submit Feedback**

Figure 15: Submit feedback page

**Tutor Progress Log**

After each tutoring session, record the mentee's progress. This is visible to coordinators and used for department reports.

**SESSIONS TO LOG**

Nguyen M. Q. Khanh · 2352525  
CO1001 - Programming Fundamentals  
Completed  
Wed, Oct 27 · 14:00–15:30 · Room B4-205 / Online

Tran H. Minh  
MA1002 - Calculus I  
Completed  
Tue, Oct 26 · 09:00–10:15 · C2-301

Le T. Cam Tu  
EE2002 - Digital Systems  
In progress  
Tue, Oct 26 · 18:30–18:00 · Lab D1

Tip: this list is usually filtered to "sessions in last 48h" holding "sessions without log".

**Nguyen M. Q. Khanh · 2352525**  
CO1001 - Programming Fundamentals  
Wed, Oct 27 · 14:00–15:30 · Room B4-205 / Online  
Topic: Recursion & pointer debugging - Lab 03

Once submitted, this log is visible to coordinator / department. You can edit within 24h.

**Understanding level**  
Excellent - fully grasped

**Engagement**  
Highly engaged

Used for student progress analytics.  
Low engagement can trigger coordinator follow-up.

**Session summary**  
Student could trace recursion stack correctly by the end. Needs follow-up on pointer-to-pointer usage.

This will appear in student dashboard + coordinator reports.

**Next recommendation / plan (optional)**  
Example: practice recursion problems 7–10, review memory model next session.

**Attach file (optional)**  
Click to upload notes or summary files (PDF, DOCX)

Attach lab notes, summary, or exercise sheets used in this session.

FR-FBK.02 - Progress Recording - Auto-timestamped - Editable 24h

**Save draft** **Submit progress log**

Figure 16: Tutor progress log page

**Completed Sessions**  
Fill in feedback to help improve tutoring quality.

**Mon · Oct 27 · 09:00 – 10:30 · C2-301**

Tutor Pham Q. T. Calculus I (MA1001)	Focus Midterm-style timed drills	Status Completed - Feedback pending
--	-------------------------------------	--

**Session summary**  
Practiced derivative problems under exam timing. You were asked to explain each step.

**Sat · Oct 18 · 08:30 – 10:00 · Online**

Tutor Truong Q. T. Digital Systems (EE2002)	Focus Timing diagrams, flip-flop troubleshooting	Status Completed - Feedback deadline passed
---	---	--

**System note**  
Marked as "Feedback Skipped" and visible to department analytics for summary only.

Your feedback is linked to this session (FR-FBK-01).

Your feedback is linked to this session (FR-FBK-01).

**Needs Feedback** **Submit Feedback** **View Session Summary**

Figure 17: Completed session page

## 10.5 MU-05 Reporting & Analytics

**TUTOR SUPPORT SYSTEM** DEPARTMENT CHAIR **Reports**

**Participation report**  
Filter by cohort/program, set thresholds.

2023 CSE Min sessions per student 2

Class	# Students	Participated
K23-CSE-01	62	41
K23-CSE-02	58	35

**Export report**

Figure 18: Participation report page

**TUTOR SUPPORT SYSTEM** STUDENT AFFAIRS **Dashboard** **Reports** **Export**

**Student Affairs Dashboard**  
Term 2025-1 · Today: 2/11/2025 **Participation** **Eligibility**

**Program Overview**

Total Participants <b>342</b> +12% vs Last Term	Eligible Students <b>287</b> +8% vs Last Term	Sessions Completed <b>1456</b> +15% vs Last Term	Avg Feedback Rate <b>89%</b> +3% vs Last Term
---	---	--	---

**System Alerts**

- ⚠️ 3 tutors have overbooked sessions this week.
- 💡 12 students have not submitted session feedback yet.
- 💡 5 students are near eligibility threshold (need 1 more session).

**Quick Actions**

- View Participation Report**
- Check Eligibility**
- Export Reports**
- Export Summary Report**

**Recent Activity**

- Participation report exported 2 hours ago By: sa\_admin
- Eligibility rules updated 5 hours ago By: sa\_admin
- PDF report generated 1 day ago By: sa\_staff

**View All Logs**

**Figure 18:** Student Affairs dashboard page

The screenshot shows the 'Eligibility / Credits' section of the dashboard. It includes fields for 'Minimum Sessions Attended' (set to 4) and 'Minimum Feedback Completion (%)' (set to 75), with a 'Recalculate Eligibility' button. Below this is a table titled 'Eligible Students (5)' listing student IDs, names, sessions attended, and feedback percentages. A summary statistics box indicates 8 total students, 5 eligible, and 3 not eligible.

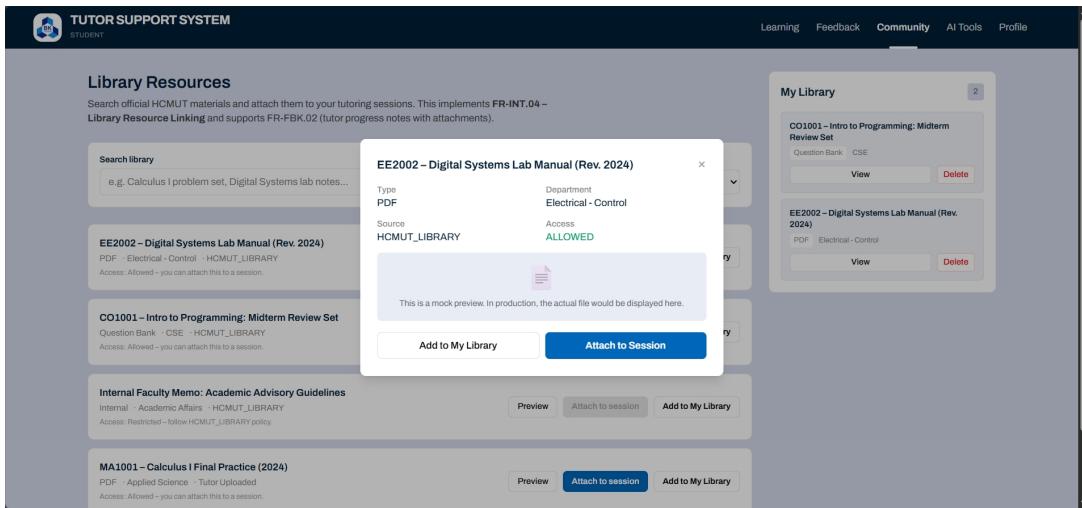
Student ID	Name	Sessions	Feedback (%)
2252001	Nguyen Van A	7	100%
2252003	Le Minh K	5	80%
2252005	Hoang Tuan L	6	83%
2252006	Nguyen Anh T	4	75%
2252007	Vo Thanh C	8	88%

**Figure 18:** Eligibility & Credits page

## 10.6 MU-06 Integration with HCMUT Infrastructure

The screenshot shows the 'Library Resources' section of the system. It lists several documents: 'EE2002 – Digital Systems Lab Manual (Rev. 2024)', 'CO1001 – Intro to Programming: Midterm Review Set', 'Internal Faculty Memo: Academic Advisory Guidelines', and 'MA1001 – Calculus I Final Practice (2024)'. Each item has 'Preview', 'Attach to session', and 'Add to My Library' buttons. To the right, a 'My Library' sidebar displays two items: 'CO1001 – Intro to Programming: Midterm Review Set' and 'EE2002 – Digital Systems Lab Manual (Rev. 2024)', each with a 'View' and 'Delete' button.

**Figure 18:** Library resource search page



**Figure 18:** Attachment to session page

## 10.7 MU-07 Study & Advanced Features

**Figure 18:** Personalized study plan page

The screenshot shows a document view page from a 'TUTOR SUPPORT SYSTEM'. At the top, there's a navigation bar with icons for user profile, Learning, Feedback, Community, AI Tools, and Profile. Below the header, a breadcrumb trail shows 'Back to Library' and the current document title: 'EE2002 - Digital Systems Lab Manual (Rev. 2024) PDF - Electrical - Control'. The main content area features the title 'Introduction to Programming' and code 'CO1001'. Below the title is a section titled 'Lecture Notes & Lab Manual' with the note 'Revision 2024'. A 'Course Overview' box contains a brief description of the course goals. A 'Learning Objectives' box lists two items: 'Understand basic programming concepts and problem-solving techniques' and 'Master C programming syntax and semantics'.

Figure 18: Document view page

This screenshot shows the 'Table of Contents' page for the same document. On the left, a sidebar displays a 'Table of Contents' with five chapters: Chapter 1: Introduction (Page 1), Chapter 2: Basic Concepts (Page 15), Chapter 3: Advanced Topics (Page 32), Chapter 4: Applications (Page 48), and Chapter 5: Exercises (Page 85). The main content area is identical to the previous screenshot, showing the course title, revision, and overview sections.

Figure 18: Table of contents page

The screenshot shows the 'Community Forum / Q&A' section of the Tutor Support System. At the top, there are dropdown menus for 'All course' and 'All status', and a search bar with placeholder text 'Find by title or keyword...'. Below this is a 'Create new question' form. The title field contains 'CO1001 – Question about assignment' and the content area contains the text 'Can I delete all and do from scratch?'. A 'Post Question' button is at the bottom right of the form. To the right of the form is a 'Moderation' button. Below the form is a 'Question List (9)' section. It lists nine questions with their titles, posters, posting times, reply counts, and status indicators (e.g., 'Pinned', 'open', 'resolved', 'pending').

Question Title	Poster	Posted	Replies	Status
CO1001 – How to pass the last test case?	CO1001	by 2353xxxx · Today 10:12	5 replies	Pinned, open
CO1001 – Question about assignment	CO1001	by you · just now	0 replies	open
CO1001 – Question about assignment	CO1001	by you · just now	0 replies	open
a	CO1001	by you · just now	0 replies	open
a	CO1001	by you · just now	0 replies	open
CO1001 – Question about pointer and array	CO1001	by 2350xxxx · 1 week ago	12 replies	resolved
PH1001 – Conservation of momentum law	PH1001	by 2251xxxx · 3 days ago	8 replies	resolved
MA1001 – Differential homework week 5	MA1001	by 2278xxxx · 2 days ago	0 replies	pending
EE2002 – Any quick tips for Karnaugh map?	EE2002	by 2252xxxx · Yesterday 21:03	2 replies	resolved

Figure 18: Community forum page

The screenshot shows the same 'Community Forum / Q&A' section as the previous image, but with a modal dialog box centered on the screen. The dialog has a green checkmark icon and the text 'Question posted successfully! Your question has been published to the forum.' A 'Close' button is at the bottom of the dialog. The rest of the page, including the question list, remains visible.

Figure 18: Successful question post page

The screenshot shows a forum post titled "CO1001 - How to pass the last test case?". The post was asked by user 2353xxxx and has 5 replies. The first reply from tutor\_co1001 suggests using fgets or read line by line then parse. The second reply from 2353xxxx says they'll try it. The third reply from 2354xxxx says they had the same issue and using fgets + sscanf worked for them. There is a "Post Reply" button at the bottom.

**Figure 18:** Reply forum's question page

The screenshot shows the "AI Quiz Generator" page. It has tabs for "Generator", "My Questions", and "Analysis", with "Generator" selected. The "Your request" section asks for practice questions based on topic, difficulty, and confusion notes. It includes fields for "Question source" (set to "Trusted bank (recommended)"), "Topic / Course" (set to "CO1001 - Recursion / Pointer Debugging"), "Difficulty" (set to "Intro / warm-up"), and "What confuses you most?" (with an example note about pointer references). A "Generate Quiz" button is at the bottom.

**Figure 18:** AI Quiz generator (1) page

The screenshot shows the 'AI Quiz Generator' page of the Tutor Support System. At the top, there's a navigation bar with links for Learning, Feedback, Community, AI Tools, and Profile. Below the navigation is a title 'AI Quiz Generator' and a subtitle 'Generate practice questions based on your topic, difficulty, and confusion notes.' There are three tabs: 'Generator' (selected), 'My Questions', and 'Analysis'. The main form area has sections for 'Your request' (with a placeholder 'Tell us what you're struggling with. We'll generate questions.'), 'Question source' (with 'Trusted bank (recommended)' selected), 'Topic / Course' (set to 'CO1001 – Recursion / Pointer Debugging'), 'Difficulty' (set to 'Intro / warm-up'), 'What confuses you most?' (with a text input example: 'Example: I keep losing track of pointer references inside recursive calls when they return new addresses.'), and a 'Generate Quiz' button. Below this is a preview of three generated questions:

- Q1. What is the base case in a recursive function?**
  - A. The case that calls the function again
  - B. The condition that stops the recursion
  - C. The first parameter of the function
  - D. The return type of the function
- Q2. What happens when you dereference a NULL pointer in C?**
  - A. Returns 0
  - B. Returns NULL
  - C. Causes undefined behavior (likely segmentation fault)
  - D. Automatically allocates memory
- Q3. Where is local variable data stored during function execution?**
  - A. Heap memory
  - B. Stack memory
  - C. Static memory
  - D. Register memory only

At the bottom of the page, it says 'Generated quizzes are automatically saved to "My Questions" page.'

Figure 18: AI Quiz generator (2) page

The screenshot shows the 'My AI Quizzes' page of the Tutor Support System. At the top, there's a navigation bar with links for Learning, Feedback, Community, AI Tools, and Profile. Below the navigation is a title 'My AI Quizzes' and a subtitle 'Review generated questions. Skip ones you don't like, or solve them to track your progress.' There are three tabs: 'Generator' (disabled), 'My Questions' (selected), and 'Analysis'. The main content area shows a list of three quizzes with their details and actions:

Question	Topic	Source	Date	Action				
What is the base case in a recursive function?	CO1001 – Recursion / Pointer Debugging	Intro / warm-up	Trusted Bank	new	11/2/2025, 2:54:47 PM	Solve	Skip	Delete
What happens when you dereference a NULL pointer in C?	CO1001 – Recursion / Pointer Debugging	Intro / warm-up	Trusted Bank	new	11/2/2025, 2:54:47 PM	Solve	Skip	Delete
Where is local variable data stored during function execution?	CO1001 – Recursion / Pointer Debugging	Intro / warm-up	Trusted Bank	new	11/2/2025, 2:54:47 PM	Solve	Skip	Delete

Figure 18: My AI Quizzes page

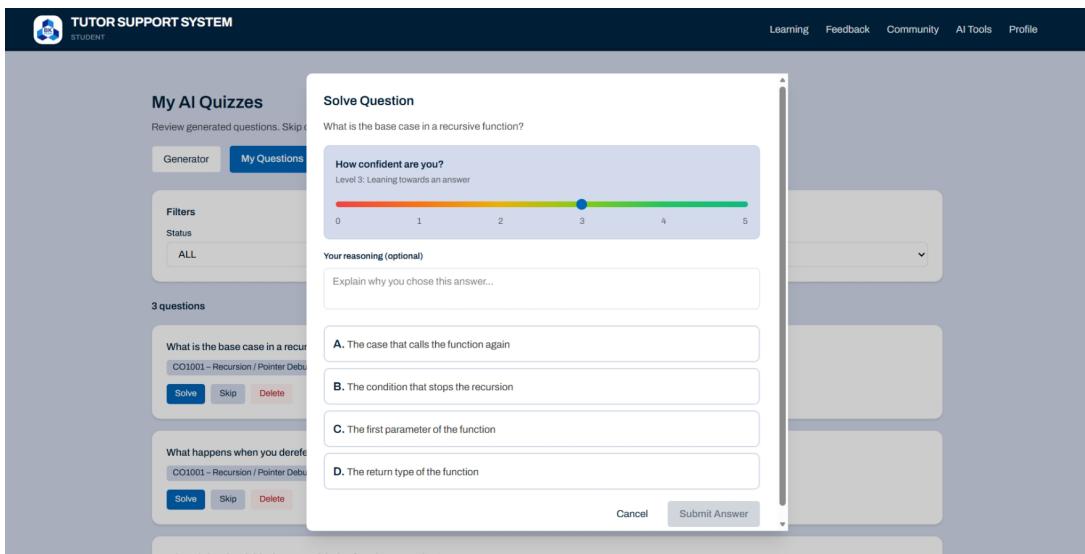


Figure 18: Solve question page (1)

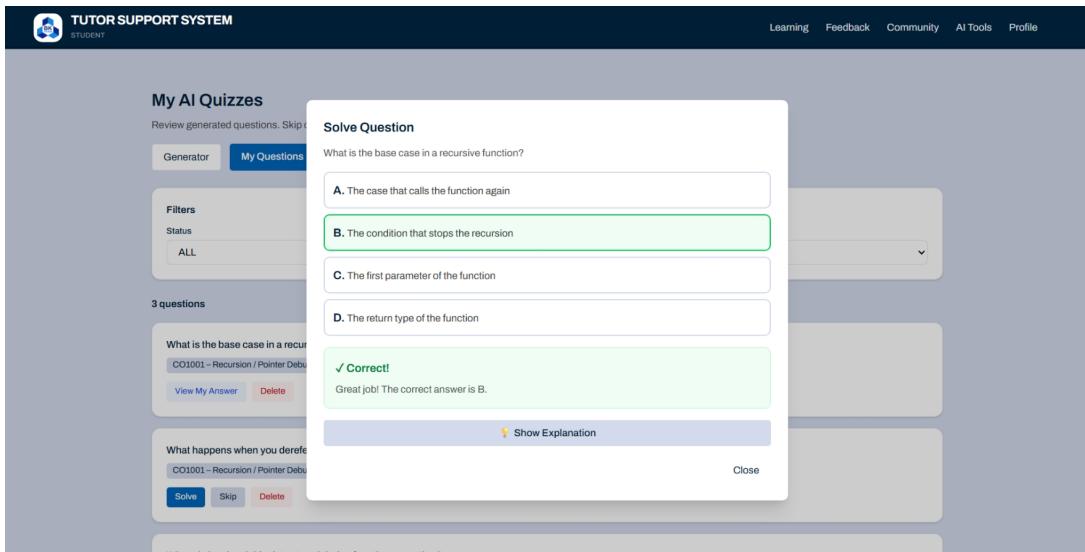
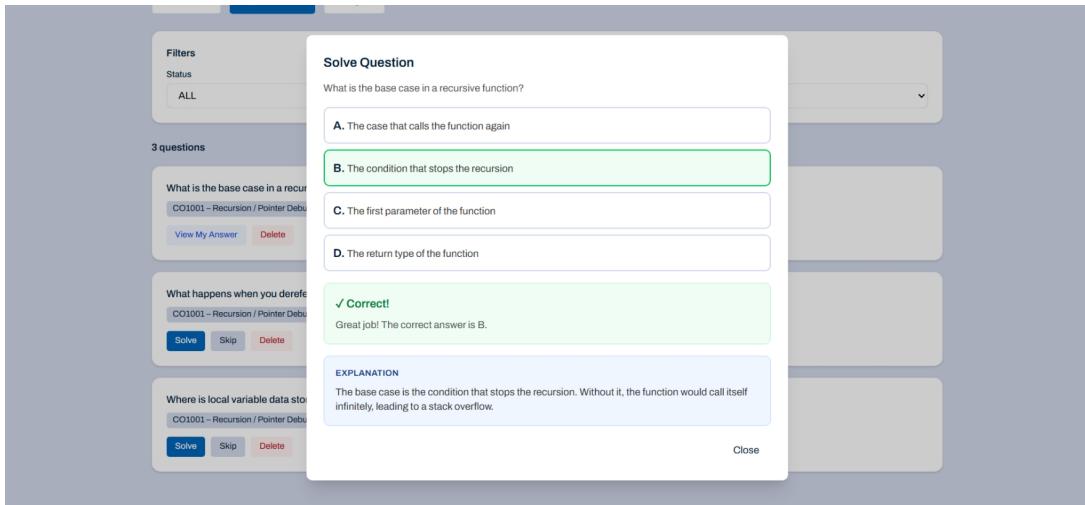


Figure 18: Solve question page (2)-answer



**Figure 18:** Solve question page (3)-explanation

The screenshot shows the 'Quiz Analysis' page of the 'TUTOR SUPPORT SYSTEM STUDENT'. The top navigation bar includes links for Learning, Feedback, Community, AI Tools, and Profile.

### Quiz Analysis

See which topics and difficulty levels you are struggling with based on your quiz history.

Generator My Questions Analysis

TOTAL GENERATED <b>3</b>	SOLVED <b>1</b>	CORRECT <b>1</b>	SKIPPED <b>0</b>	TRUSTED VS AI <b>1/0</b>
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#### Confidence Level Analysis

Understanding your confidence patterns helps AI recommend better questions for your learning style.

LOW CONFIDENCE (0-1) <b>0</b> No attempts yet	MID CONFIDENCE (2-3) <b>1</b> 100% correct	HIGH CONFIDENCE (4-5) <b>0</b> No attempts yet			
0: No Idea <b>0</b>	1: Wild Guess <b>0</b>	2: Unsure <b>0</b>	3: Leaning <b>1</b> 100% correct	4: Confident <b>0</b>	5: Absolutely <b>0</b>

AI RECOMMENDATIONS

#### Weak Topics (lowest accuracy first)

CO1001 – Recursion / Pointer Debugging  
Generated: 3 Solved: 1 Correct: 1 Skipped: 0 100% accuracy

#### Source Effectiveness

Trusted Bank Generated: 3 Solved: 1 Correct: 1	100% solved
AI Freeform Generated: 0 Solved: 0 Correct: 0	0% solved

#### Difficulty Breakdown

Intro / warm-up 1/3 solved

**Figure 18:** Quiz analysis page

## 10.8 MU-08 Admin Tools

The screenshot shows the Admin Dashboard of the Tutor Support System. At the top, there are four status boxes: SSO Status (Online, green), Last Datacore Sync (5 mins ago, blue), Pending Exports (2, orange), and Audit Events (134, gray). Below this is a section for Recent Exports, listing three reports: Departmental Report (CSV) E-090 (Done), Participation Report (PDF) E-091 (Queued), and Audit Logs (CSV) E-092 (Processing). The final section is Integrations, showing three entries: HCMUT\_SSO (OK, last checked 2025-11-02 10:05), DATACORE (OK, last checked 2025-11-02 10:03), and HCMUT\_LIBRARY (DEGRADED, last checked 2025-11-02 09:58).

Figure 18: Admin dashboard page

The screenshot shows the Audit Logs page. It features a filter section with fields for Actor (user or system) and Event Type (set to All Events). Below this is a table titled "Audit Events (8)" with columns: Time, Actor, Event, Target, and Details. The events listed are:

Time	Actor	Event	Target	Details
2025-11-02 10:10	admin@hcmut.edu.vn	EXPORT	Departmental CSV	Job E-091 created
2025-11-02 10:05	system	SYNC	DATACORE	34 profiles updated
2025-11-02 09:55	coord01	ROLE_CHANGE	student 2352525	Role -> TUTOR (temporary)
2025-11-02 09:40	admin@hcmut.edu.vn	EXPORT	Audit Logs CSV	Job E-092 created
2025-11-02 09:30	2352525@hcmut.edu.vn	LOGIN	Student Portal	SSO authentication successful
2025-11-02 09:15	system	SYNC	HCMUT_LIBRARY	12 resources indexed
2025-11-02 08:50	coord01	ROLE_CHANGE	student 2353001	Role -> COORDINATOR (temporary)
2025-11-02 08:30	admin@hcmut.edu.vn	LOGIN	Admin Portal	SSO authentication successful

Figure 18: Audit logs page

**Integrations**

Monitor and test connections to HCMUT\_SSO, DATACORE, and HCMUT\_LIBRARY.

Integration	Status	Last sync
HCMUT_SSO	Online	2025-11-02 10:05
DATACORE	Online	2025-11-02 10:03
HCMUT_LIBRARY	Degraded	2025-11-02 09:58

**Last Integration Errors**

Integration	Error Message	Timestamp
HCMUT_LIBRARY	403 - access restricted for course resources	2025-11-02 09:58

Figure 18: Integrations page

**Exports & Reports**

Recent exports and their statuses. You can trigger new exports for Departmental, Participation, and Audit reports.

**Create New Export**

- New: Departmental (CSV)
- New: Participation (PDF)
- New: Audit Logs (CSV)

**Export Jobs**

Job ID	Name	Requested at	Status	Actions
E-090	Departmental Report (CSV)	2025-11-01 21:15	Done	Download
E-091	Participation Report (PDF)	2025-11-02 08:05	Queued	Cancel
E-092	Audit Logs (CSV)	2025-11-02 09:40	Processing	Cancel
E-093	System Errors (JSON)	2025-11-02 10:05	Failed	Retry

Figure 18: Export & Report page

**Users & Roles**

Inspect current roles (Student, Tutor, Coordinator, Department Chair, Program Admin) and local overrides.

**Search Users**

**Sync roles from DATACORE (mock)**

**Users (5)**

User	Email / ID	Current Role(s)	Source	Actions
2352525 – Khanh	2352525@hcmut.edu.vn	Student	DATACORE	<a href="#">View</a> <a href="#">Add role</a> <a href="#">Remove role</a>
coord01 – Student Affairs	coord01@hcmut.edu.vn	Coordinator, StudentAffairs	Local Override	<a href="#">View</a> <a href="#">Add role</a> <a href="#">Remove role</a>
admin	admin@hcmut.edu.vn	ProgramAdmin	Local	<a href="#">View</a> <a href="#">Add role</a> <a href="#">Remove role</a>
2353001 – Minh	2353001@hcmut.edu.vn	Student, Tutor	Local Override	<a href="#">View</a> <a href="#">Add role</a> <a href="#">Remove role</a>
dept01 – CS Dept Chair	dept01@hcmut.edu.vn	DepartmentChair	DATACORE	<a href="#">View</a> <a href="#">Add role</a> <a href="#">Remove role</a>

Figure 18: Users & Roles page

The screenshot shows the 'System Tasks' page of the 'TUTOR SUPPORT SYSTEM'. At the top, there is a navigation bar with links for Dashboard, Exports, Integrations, Audit, Users & Roles, and System Tasks. The 'System Tasks' link is highlighted. Below the navigation bar, the title 'System Tasks' is displayed, followed by a subtitle: 'View and run scheduled tasks such as DB cleanup, log archiving, and backups.'

**Scheduled Tasks**

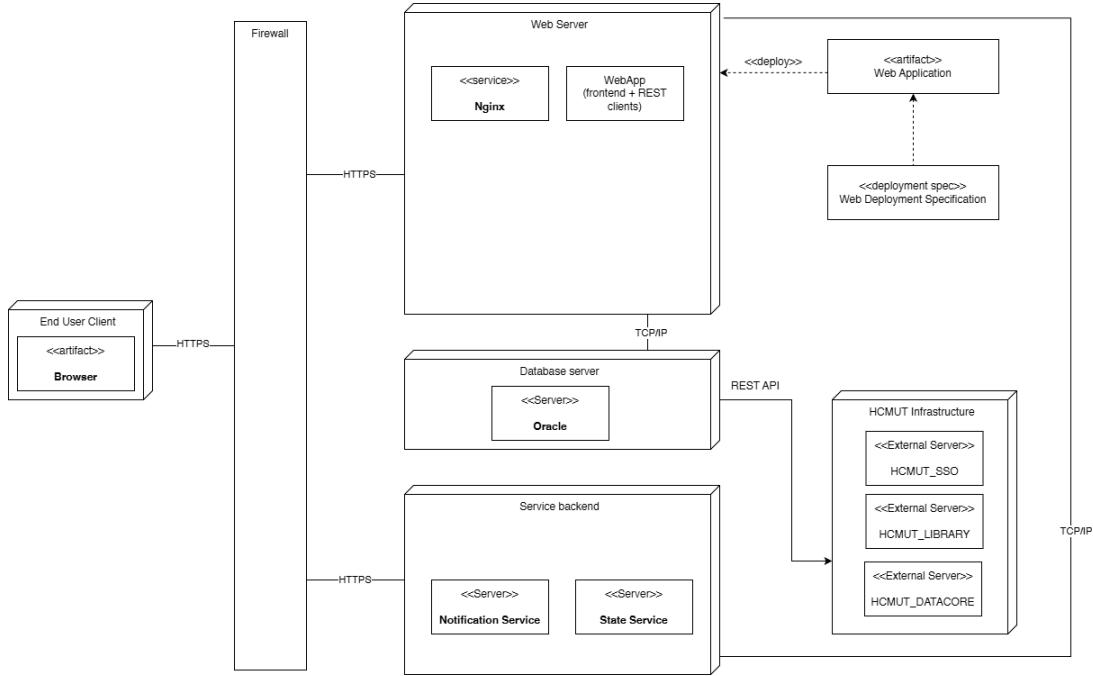
Task	Schedule	Last run	Status
Daily DB cleanup	Everyday at 03:00	2025-11-02 03:01	Success
Incremental backup	Every 15 minutes	2025-11-02 10:00	Success
Full backup	Everyday at 01:00	2025-11-02 01:02	Success

**Task History**

Time	Task	Result
2025-11-02 03:01	Daily DB cleanup	OK (12 MB freed)
2025-11-02 01:02	Full backup	OK (stored in dc-hcmut-bucket-02)
2025-11-01 03:01	Daily DB cleanup	OK (9 MB freed)

**Figure 18:** System tasks page

# 11 Deployment Diagram



**Figure 12:** Deployment Diagram

## 11.1 Deployment View Description

The deployment diagram in Figure ?? illustrates the physical runtime environment of the Tutor Support System, showing how software components are deployed across servers and how they communicate through secure protocols.

### End User Client Layer

End users interact with the system through a web browser, represented as an **«artifact»**. All communication between the client and the system is performed using HTTPS, ensuring encrypted and secure transmission of requests.

### Firewall Layer

All incoming and outgoing traffic is filtered through a Firewall. This firewall protects the internal infrastructure by allowing only authorized protocols (e.g., HTTPS on port 443) and restricting unauthorized access from external networks.

### Web Server Layer

The Web Server hosts two primary components:

- **Nginx:** Operates as a reverse proxy and static file server, routing incoming HTTPS requests to appropriate backend services.
- **WebApp (frontend + REST clients):** Contains the user interface and the REST clients responsible for communicating with backend services and external systems.

The Web Application artifact is deployed onto this node according to the *Web Deployment Specification*, which defines the packaging and deployment procedures. Communication from the Web Server to backend services uses secure protocols depending on the target module.

## Database Server Layer

The Database Server hosts the Oracle database, which stores persistent application data such as user profiles, tutor availability, booking information, session records, and system logs. Communication between the Web Server and the Oracle database is performed over TCP/IP to ensure consistent and reliable data transactions.

## Service Backend Layer

This layer hosts two supporting infrastructure services:

- **Mail Server:** Responsible for sending notification emails, including booking confirmations and schedule updates.
- **State Service:** Provides in-memory storage for transient system state such as session data, caching, and booking locks.

Communication between the Web Server and this backend layer is secured through HTTPS.

## HCMUT Infrastructure Layer

The system integrates with a set of university-provided external services:

- **HCMUT\_SSO:** Provides authentication services through SAML/OAuth-based single sign-on.
- **HCMUT\_LIBRARY:** Provides access to academic resources and related materials.
- **HCMUT\_DATACORE:** Supplies institutional user data for identity synchronization and academic information retrieval.

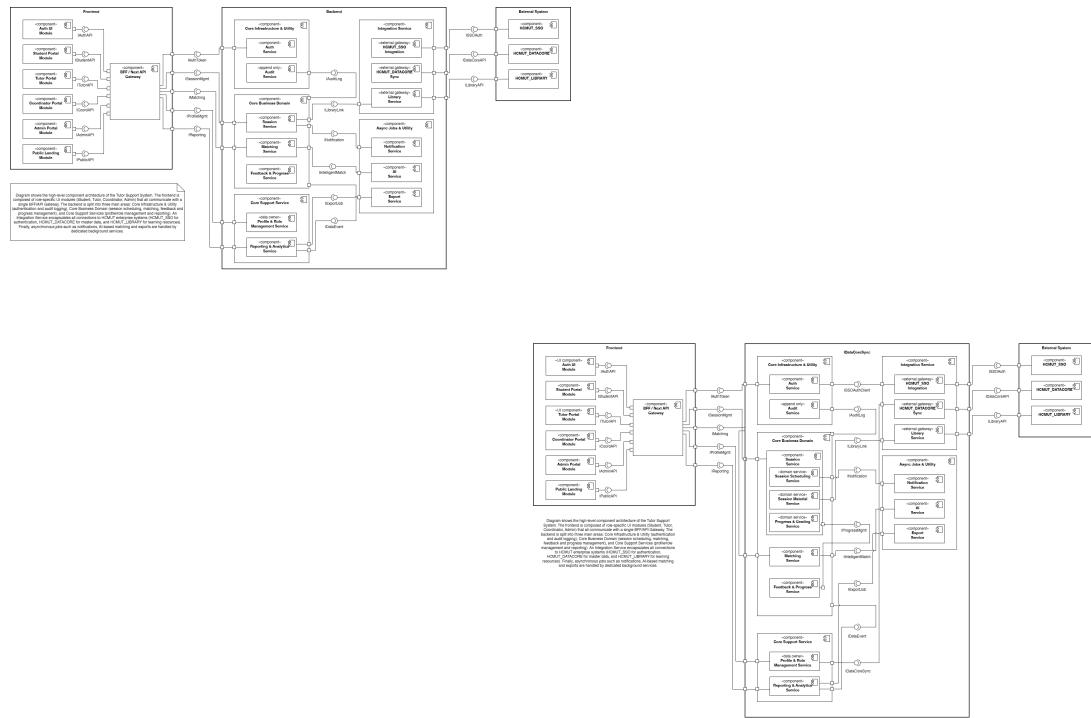
These services are accessed from the Web Server using REST APIs over HTTPS, ensuring secure and authenticated data exchange.

## Overall System Communication Flow

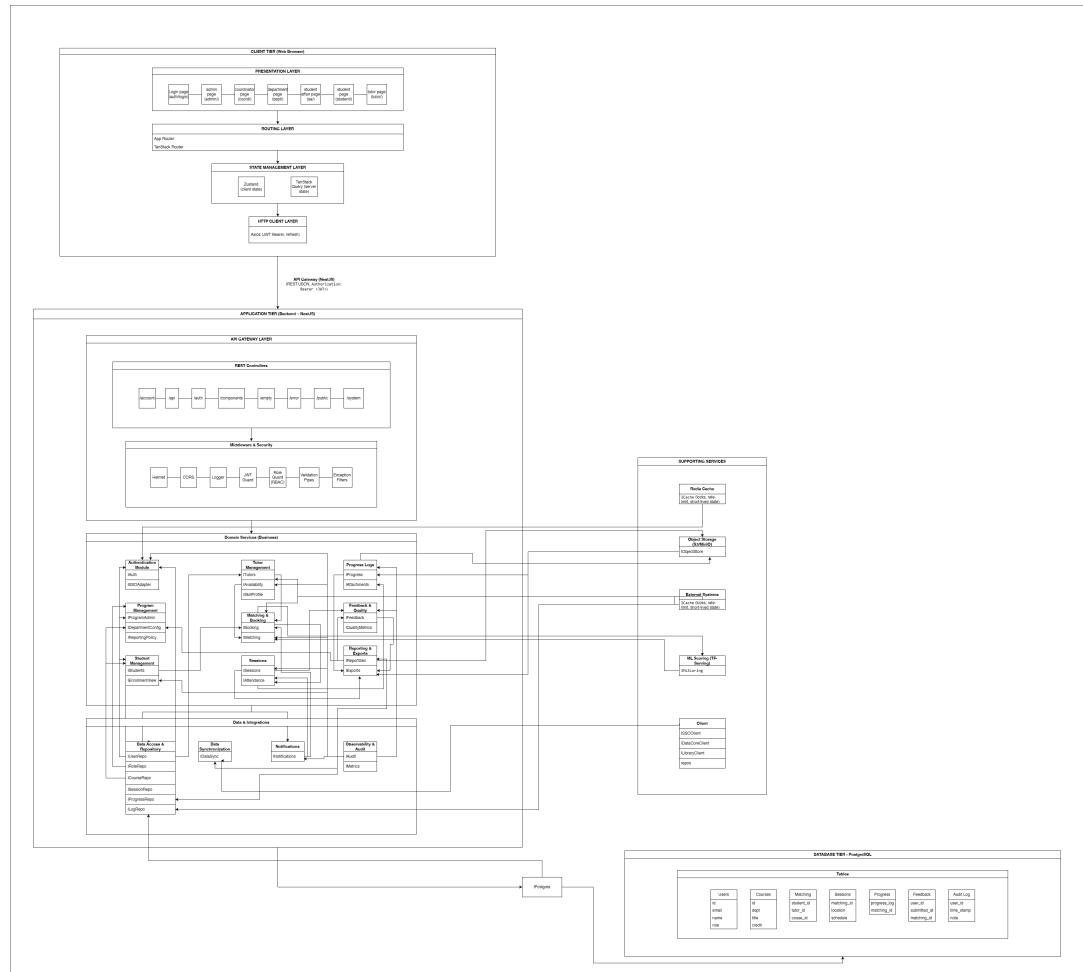
When a user interacts with the system, requests are sent from the Browser through the Firewall to the Web Server. Nginx forwards these requests to the WebApp component, which communicates with internal backend services (database, mail, state). For authentication or user data synchronization, the WebApp interacts with the HCMUT\_SSO and HCMUT\_DATACORE services. When academic materials are needed, the system retrieves them from the HCMUT\_LIBRARY service. Processed responses are returned through the Firewall back to the user's browser over HTTPS.

This deployment architecture ensures security, scalability, maintainability, and seamless integration with university services.

## 12 Development Diagram

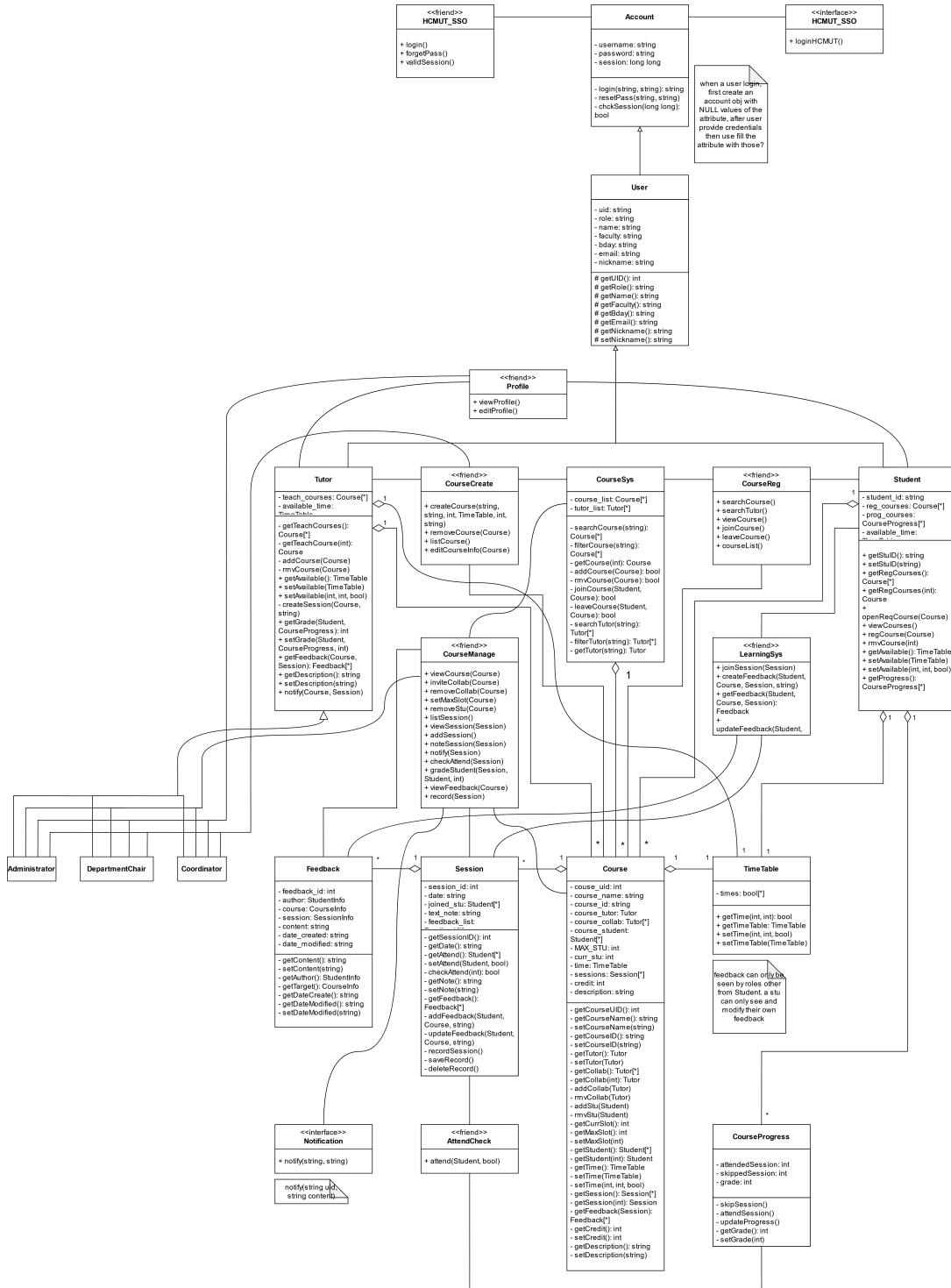


**Figure 13:** Component Diagram



**Figure 14:** Package Diagram

## 13 Class Diagram



**Figure 15:** Class Diagram

## 14 Test case

### 14.1 Testcase Use-case 1

<b>Test case</b>	UC01a-01: Successful Login via SSO
<b>Test description</b>	User successfully logs in with valid SSO credentials and is redirected to the appropriate dashboard.
<b>Related screens</b>	Login Page → HCMUT_SSO Portal → Home Dashboard
<b>Pre-conditions</b>	<ol style="list-style-type: none"><li>1. User has valid HCMUT SSO credentials.</li><li>2. HCMUT_SSO service is operational.</li><li>3. User role exists in DATACORE.</li></ol>
<b>Actions</b>	<ol style="list-style-type: none"><li>1. Navigate to application login page.</li><li>2. Click “Login via SSO” button.</li><li>3. Enter valid SSO username and password.</li><li>4. Click “Submit”.</li><li>5. System validates credentials via HCMUT_SSO.</li><li>6. System retrieves role from DATACORE.</li><li>7. User is redirected to role-appropriate dashboard.</li></ol>
<b>Inputs</b>	Any valid HCMUT SSO username and password combination that exists in HCMUT_SSO database (student, tutor, coordinator, department chair, or admin accounts).
<b>Expected Outputs</b>	<ol style="list-style-type: none"><li>1. User is authenticated successfully.</li><li>2. Role is assigned automatically based on DATACORE.</li><li>3. Session is established and logged.</li><li>4. User sees dashboard appropriate to their role (Student/Tutor/Coordinator/etc.).</li></ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

Figure 15: Testcase Successful Login via SSO

<b>Test case</b>	UC01a-02: Failed Login with Invalid SSO Credentials
<b>Test description</b>	User attempts to log in with invalid SSO credentials and access is denied.
<b>Related screens</b>	Login Page → HCMUT_SSO Portal
<b>Pre-conditions</b>	HCMUT_SSO service is operational.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to login page.</li> <li>2. Click “Login via SSO”.</li> <li>3. Enter invalid username or password.</li> <li>4. Click “Submit”.</li> </ol>
<b>Inputs</b>	Any invalid username/password combination including: non-existent usernames, incorrect passwords for valid usernames, expired credentials, deactivated accounts, or malformed email addresses.
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Access is denied.</li> <li>2. Error message displayed: “Invalid credentials. Please try again.”</li> <li>3. User remains on login page.</li> <li>4. No session is created.</li> <li>5. Failed login attempt is logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure 16: Testcase Failed Login with Invalid SSO Credentials

<b>Test case</b>	UC01a-03: Login with Empty/Null Credentials
<b>Test description</b>	System validates that both username and password fields are required.
<b>Related screens</b>	Login Page
<b>Pre-conditions</b>	HCMUT_SSO service is operational.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to login page.</li> <li>2. Click “Login via SSO” button.</li> <li>3. Leave one or both fields empty.</li> <li>4. Click “Submit”.</li> </ol>
<b>Inputs</b>	Empty username, empty password, or both fields empty (null values).
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Validation error displayed.</li> <li>2. Error message: “Please enter both username and password.”</li> <li>3. Required fields highlighted.</li> <li>4. No authentication request sent to SSO.</li> <li>5. User remains on login page.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure 17: Testcase Login with Empty/Null Credentials

<b>Test case</b>	UC01a-04: Login When SSO Service is Unavailable
<b>Test description</b>	System displays appropriate error message when SSO service is down or unreachable.
<b>Related screens</b>	Login Page
<b>Pre-conditions</b>	HCMUT_SSO service is down or unreachable (mocked).
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to login page.</li> <li>2. Click “Login via SSO” button.</li> <li>3. System attempts to connect to SSO service.</li> </ol>
<b>Inputs</b>	Any input (service unavailability tested regardless of input).
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Error message: “SSO service is currently unavailable. Please try again later.”</li> <li>2. User cannot proceed with login.</li> <li>3. Error is logged in system logs.</li> <li>4. No session is created.</li> </ol>
<b>Testing environment</b>	Test environment with mocked SSO service outage

Figure 18: Testcase Login When SSO Service is Unavailable

<b>Test case</b>	UC01a-05: Role Assignment for All User Types
<b>Test description</b>	System correctly assigns appropriate role based on DATACORE data for all user types.
<b>Related screens</b>	Login Page → HCMUT_SSO → Role-Specific Dashboard
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User has valid SSO credentials.</li> <li>2. User role data exists in DATACORE.</li> <li>3. HCMUT_SSO service is available.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to login page.</li> <li>2. Complete SSO authentication.</li> <li>3. System fetches role from DATACORE.</li> <li>4. System assigns appropriate role.</li> <li>5. User is redirected to role-specific dashboard.</li> </ol>
<b>Inputs</b>	Valid credentials for any user type: Student, Tutor, Coordinator, Department Chair, or Administrator accounts.
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. User authenticated successfully.</li> <li>2. Correct role assigned based on DATACORE (Student/Tutor/Coordinator/Chair/Admin).</li> <li>3. User sees role-appropriate dashboard and features.</li> <li>4. User menu shows role-specific options.</li> <li>5. Role assignment is logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

Figure 19: Testcase Role Assignment for All User Types

<b>Test case</b>	UC01b-01: View Profile Information
<b>Test description</b>	Authenticated user can view their complete profile information synchronized from DATACORE.
<b>Related screens</b>	Profile Page
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User is authenticated via SSO.</li> <li>2. User profile exists in DATACORE.</li> <li>3. System is operational.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in with valid credentials.</li> <li>2. Navigate to “Profile” or “My Profile” section.</li> <li>3. View profile information.</li> </ol>
<b>Inputs</b>	Any authenticated user (all role types).
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Profile page displays all fields: Student/Staff ID, Full Name, Email, Faculty/Department, Role.</li> <li>2. Data matches DATACORE information.</li> <li>3. Profile view is logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure 20: Testcase View Profile Information

<b>Test case</b>	UC01b-02: Update Non-Core Profile Details
<b>Test description</b>	User can successfully update editable profile fields with various valid inputs.
<b>Related screens</b>	Profile Page → Edit Profile
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User is authenticated via SSO.</li> <li>2. User profile exists in DATACORE.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to profile page.</li> <li>2. Click “Edit Profile”.</li> <li>3. Update non-core fields (phone, bio, preferences).</li> <li>4. Click “Save” or “Update”.</li> </ol>
<b>Inputs</b>	Any valid data for editable fields: phone numbers (various formats), bio text (up to character limit), preferences (all available options), profile picture, language preference, notification settings.
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Profile updated successfully.</li> <li>2. Success message: “Profile updated successfully”.</li> <li>3. Changes saved to database with timestamp.</li> <li>4. Updated information visible on profile page.</li> <li>5. Update event is logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Firefox

Figure 21: Testcase Update Non-Core Profile Details

<b>Test case</b>	UC01b-03: Update Profile with Invalid Data
<b>Test description</b>	System validates and rejects invalid profile update inputs.
<b>Related screens</b>	Profile Page → Edit Profile
<b>Pre-conditions</b>	User is authenticated and has a profile.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to profile page.</li> <li>2. Click “Edit Profile”.</li> <li>3. Enter invalid data in editable fields.</li> <li>4. Click “Save”.</li> </ol>
<b>Inputs</b>	Various invalid inputs: malformed phone numbers, text exceeding maximum length limits, special characters in restricted fields, SQL injection attempts, XSS scripts, invalid file types for profile picture, empty required fields.
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System validates input and rejects invalid data.</li> <li>2. Appropriate error messages displayed for each validation failure.</li> <li>3. No changes saved to database.</li> <li>4. User remains on edit page to correct errors.</li> <li>5. Invalid fields highlighted.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure 22: Testcase Update Profile with Invalid Data

<b>Test case</b>	UC01b-04: Attempt to Update Core Profile Fields
<b>Test description</b>	Core profile fields synchronized from DATACORE cannot be edited by any user.
<b>Related screens</b>	Profile Page → Edit Profile
<b>Pre-conditions</b>	User is authenticated and has a profile synchronized from DATACORE.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to profile page.</li> <li>2. Click “Edit Profile”.</li> <li>3. Attempt to modify core fields (ID, Name, Email, Faculty, Role).</li> </ol>
<b>Inputs</b>	Any attempted modification to core fields: Student/Staff ID, Full Name, Email address, Faculty/Department, Role.
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Core fields are read-only (disabled/greyed out).</li> <li>2. Error message if modification attempted: “Core profile fields are managed by HCMUT DATACORE and cannot be modified”.</li> <li>3. No changes are saved to core fields regardless of method used.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure 23: Testcase Attempt to Update Core Profile Fields

<b>Test case</b>	UC01b-05: Profile Sync with DATACORE
<b>Test description</b>	Profile updates are synchronized with DATACORE when service is available.
<b>Related screens</b>	Profile Page
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User is authenticated.</li> <li>2. DATACORE is available.</li> <li>3. User has updated non-core profile fields.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Update non-core profile fields.</li> <li>2. Save changes.</li> <li>3. System initiates sync with DATACORE.</li> </ol>
<b>Inputs</b>	Any valid updates to non-core fields.
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Profile update saved locally.</li> <li>2. System transmits data to DATACORE.</li> <li>3. Sync status logged with timestamp.</li> <li>4. Confirmation of successful sync displayed.</li> </ol>
<b>Testing environment</b>	Web application with DATACORE integration

**Figure 24:** Testcase Profile Sync with DATACORE

## 14.2 Testcase Use-case 2

<b>Test case</b>	UC02-01: Successful Manual Tutor Search by Subject
<b>Test description</b>	Student searches for tutors by subject and receives a list of matching tutors.
<b>Related screens</b>	Find a Tutor → Search Results
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Student is authenticated.</li> <li>2. At least one tutor profile with subject expertise exists.</li> <li>3. System is operational.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as student.</li> <li>2. Navigate to “Find a Tutor” page.</li> <li>3. Enter subject name “Calculus” in search field.</li> <li>4. Click “Search” button.</li> <li>5. View search results.</li> </ol>
<b>Inputs</b>	Any subject name that exists in the tutor database (e.g., Calculus, Physics, Programming, Mathematics, etc.)
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System displays list of tutors teaching Calculus.</li> <li>2. Each tutor shows: name, subject(s), availability, rating.</li> <li>3. Results sorted by relevance or rating.</li> <li>4. “Select” or “Request Match” button available for each tutor.</li> <li>5. Search query logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

**Figure XX:** Testcase Successful Manual Tutor Search by Subject

<b>Test case</b>	UC02-02: Search Tutor by Availability Filter
<b>Test description</b>	Student filters tutor search results by availability time slots.
<b>Related screens</b>	Tutor Search Page → Filtered Results
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Student is authenticated.</li> <li>2. Multiple tutors exist with different availability schedules.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to tutor search page.</li> <li>2. Apply availability filter: "Monday 9:00-12:00".</li> <li>3. Click "Search" or "Apply Filter".</li> <li>4. View filtered results.</li> </ol>
<b>Inputs</b>	Any valid time slot filter (day of week and time range)
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Only tutors available during selected time displayed.</li> <li>2. Each result shows availability slots.</li> <li>3. No tutors without matching availability shown.</li> <li>4. Filtered search logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Search Tutor by Availability Filter

<b>Test case</b>	UC02-03: No Tutors Found - Broaden Search Suggestion
<b>Test description</b>	When no tutors match search criteria, system suggests broadening the search.
<b>Related screens</b>	Tutor Search Page
<b>Pre-conditions</b>	Search criteria is very specific with no matching tutors.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as student.</li> <li>2. Navigate to tutor search.</li> <li>3. Enter very specific criteria (rare subject + specific time).</li> <li>4. Click "Search".</li> </ol>
<b>Inputs</b>	Very specific/rare combinations of subject and availability that have no matching tutors
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Empty result set returned.</li> <li>2. Message: "No tutors found matching your criteria. Try broadening your search."</li> <li>3. Suggestions: Remove filters, try different times, search related subjects.</li> <li>4. Option to request coordinator assistance.</li> <li>5. Zero-result search logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase No Tutors Found – Broaden Search Suggestion

<b>Test case</b>	UC02-04: Successful Manual Tutor Selection
<b>Test description</b>	Student successfully selects a tutor and sends a match request.
<b>Related screens</b>	Search Results → Match Request Confirmation
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Student has searched and found suitable tutors.</li> <li>2. <u>Tutor is available.</u></li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Search for tutors.</li> <li>2. Review search results.</li> <li>3. Click “Select” or “Request Match” for a tutor.</li> <li>4. <u>Confirm selection.</u></li> </ol>
<b>Inputs</b>	Any available tutor from search results
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Pending match request created.</li> <li>2. Confirmation: “Match request sent to [Tutor Name]. Awaiting tutor confirmation.”</li> <li>3. Tutor receives notification of match request.</li> <li>4. Match status = “Awaiting Tutor Confirmation”.</li> <li>5. Match request logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

**Figure XX:** Testcase Successful Manual Tutor Selection

<b>Test case</b>	UC02-05: Tutor Confirms Match Request
<b>Test description</b>	Tutor reviews and confirms a pending match request from a student.
<b>Related screens</b>	Pending Match Requests → Confirmation Page
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Pending match request exists from student.</li> <li>2. Tutor is authenticated.</li> <li>3. Tutor <u>has capacity to accept more students.</u></li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as tutor.</li> <li>2. Navigate to “Pending Match Requests”.</li> <li>3. View match request details.</li> <li>4. Click “Accept” or “Confirm Match”.</li> <li>5. <u>Confirm action.</u></li> </ol>
<b>Inputs</b>	Any pending match request
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Match confirmed and finalized.</li> <li>2. Both student and tutor receive confirmation notification.</li> <li>3. Student sees matched tutor in “My Tutor” section.</li> <li>4. Tutor sees student in “My Students” section.</li> <li>5. Match status = “Active”, logged with timestamp.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Firefox

**Figure XX:** Testcase Tutor Confirms Match Request

<b>Test case</b>	UC02-06: Tutor Rejects Match Request
<b>Test description</b>	Tutor declines a match request and student is notified to search for another tutor.
<b>Related screens</b>	Pending Match Requests
<b>Pre-conditions</b>	Pending match request exists, tutor is authenticated.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as tutor.</li> <li>2. Navigate to pending match requests.</li> <li>3. View match request.</li> <li>4. Click “Reject” or “Decline”.</li> <li>5. Optionally provide reason: “Schedule conflict”.</li> <li>6. Confirm rejection.</li> </ol>
<b>Inputs</b>	Any pending match request with optional rejection reason
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Match request rejected.</li> <li>2. Student notification: “Your match request was declined. You can search for another tutor or request coordinator assistance.”</li> <li>3. Match status = “Rejected”.</li> <li>4. Student can initiate new search.</li> <li>5. Rejection logged with reason.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Tutor Rejects Match Request

<b>Test case</b>	UC02-07: Request Auto-Match (Automated Matching)
<b>Test description</b>	Student requests automated tutor matching and receives ranked recommendations.
<b>Related screens</b>	Find a Tutor → Auto-Match → Recommendations
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Student is authenticated.</li> <li>2. Multiple tutors available.</li> <li>3. Auto-match algorithm is operational.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to “Find a Tutor”.</li> <li>2. Click “Auto-Match” or “Smart Match”.</li> <li>3. Enter preferences: subject, availability, mode.</li> <li>4. Click “Find Best Match”.</li> <li>5. System runs matching algorithm.</li> </ol>
<b>Inputs</b>	Subject name, availability preference (morning/afternoon/evening/weekend), and session mode (online/in-person)
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System returns ranked list of recommended tutors.</li> <li>2. Recommendations based on: expertise, availability, ratings, preferences.</li> <li>3. Top 3-5 tutors displayed with match score/percentage.</li> <li>4. Student can select from recommendations.</li> <li>5. Auto-match request logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Request Auto-Match (Automated Matching)

<b>Test case</b>	UC02-08: Tutor Does Not Respond - Coordinator Notification
<b>Test description</b>	When tutor doesn't respond within time limit, coordinator is notified to handle the match.
<b>Related screens</b>	Match Request Status → Coordinator Dashboard
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Pending match request exists.</li> <li>2. Tutor has not responded within 48 hours.</li> <li>3. System timeout mechanism configured.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student sends match request.</li> <li>2. Wait for timeout period (48 hours).</li> <li>3. Tutor does not respond.</li> <li>4. System triggers timeout action.</li> </ol>
<b>Inputs</b>	System timeout period (configured value) and any pending match request
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System detects timeout.</li> <li>2. Coordinator receives notification: "Match request MAT-003 has not been responded to. Please assign a tutor."</li> <li>3. Student notification: "Your match request is being handled by a coordinator."</li> <li>4. Match status = "Coordinator Review".</li> <li>5. Timeout event logged.</li> </ol>
<b>Testing environment</b>	Test environment with timeout simulation

**Figure XX:** Testcase Tutor Does Not Respond – Coordinator Notification

<b>Test case</b>	UC02-09: Coordinator Manual Assignment
<b>Test description</b>	Coordinator manually assigns a tutor to a student when automated matching fails.
<b>Related screens</b>	Coordinator Dashboard → Pending Assignments
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Coordinator is authenticated.</li> <li>2. Match request is in “Coordinator Review” status.</li> <li>3. Available tutors exist.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as coordinator.</li> <li>2. Navigate to “Pending Assignments”.</li> <li>3. View student’s match request details.</li> <li>4. Search for suitable tutor.</li> <li>5. Select appropriate tutor.</li> <li>6. Click “Assign Tutor” and confirm.</li> </ol>
<b>Inputs</b>	Student needing assignment, subject required, and available suitable tutor
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Tutor assigned to student.</li> <li>2. Both parties receive notification.</li> <li>3. Match status = “Active (Coordinator Assigned)”.</li> <li>4. Student can schedule sessions with assigned tutor.</li> <li>5. Assignment logged with coordinator ID.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Coordinator Manual Assignment

### 14.3 Testcase Use-case 3

<b>Test case</b>	UC03a-01: Successfully Create Availability Slot
<b>Test description</b>	Tutor creates a new availability slot for students to book sessions.
<b>Related screens</b>	Set Availability → Create Slot
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Tutor is authenticated.</li> <li>2. Scheduling database is accessible.</li> <li>3. No conflicting slots exist.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as tutor.</li> <li>2. Navigate to “Set Availability” or “Manage Schedule”.</li> <li>3. Click “Add New Slot” or “Create Availability”.</li> <li>4. Enter slot details: date, start time, end time, mode, location.</li> <li>5. Click “Save” or “Publish”</li> </ol>
<b>Inputs</b>	Future date, valid start time, valid end time (end > start), session mode (online/in-person), optional location
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Availability slot created successfully.</li> <li>2. Confirmation: “Availability slot created successfully”.</li> <li>3. Slot appears in tutor’s calendar.</li> <li>4. Slot visible to students for booking.</li> <li>5. Creation logged with timestamp.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

Figure XX: Testcase Successfully Create Availability Slot

<b>Test case</b>	UC03a-02: Attempt to Create Overlapping Slot
<b>Test description</b>	System prevents creation of overlapping availability slots.
<b>Related screens</b>	Set Availability
<b>Pre-conditions</b>	Existing slot: Monday 14:00-16:00.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as tutor.</li> <li>2. Attempt to create new overlapping slot.</li> <li>3. Date: Same Monday, Start: 15:00, End: 17:00.</li> <li>4. Click “Save”</li> </ol>
<b>Inputs</b>	Any new time slot that overlaps with existing slot (same day, overlapping time range)
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System detects overlap.</li> <li>2. Slot creation rejected.</li> <li>3. Error: “This slot overlaps with an existing availability slot (Monday 14:00-16:00). Please choose a different time.”</li> <li>4. New slot NOT created.</li> <li>5. Conflict logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure XX: Testcase Attempt to Create Overlapping Slot

<b>Test case</b>	UC03a-03: Delete Unbooked Availability Slot
<b>Test description</b>	Tutor successfully deletes an availability slot that has not been booked.
<b>Related screens</b>	Availability Calendar
<b>Pre-conditions</b>	Tutor is authenticated, unbooked slot exists.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to availability calendar.</li> <li>2. Select unbooked slot.</li> <li>3. Click “Delete” or “Remove”.</li> <li>4. Confirm deletion.</li> </ol>
<b>Inputs</b>	Any unbooked availability slot
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Confirmation prompt: “Are you sure you want to delete this slot?”</li> <li>2. Slot deleted upon confirmation.</li> <li>3. Success message: “Slot deleted successfully”.</li> <li>4. Slot removed from calendar.</li> <li>5. No longer visible to students.</li> <li>6. Deletion logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure XX: Testcase Delete Unbooked Availability Slot

<b>Test case</b>	UC03a-04: Attempt to Delete Booked Slot
<b>Test description</b>	System prevents deletion of a slot that has been booked by a student.
<b>Related screens</b>	Availability Calendar
<b>Pre-conditions</b>	Booked slot exists.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to availability calendar.</li> <li>2. Select booked slot.</li> <li>3. Attempt to delete.</li> </ol>
<b>Inputs</b>	Any booked availability slot
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. “Delete” button disabled or not visible.</li> <li>2. Error if attempted: “Cannot delete a booked slot. Please cancel the session first.”</li> <li>3. Slot not deleted.</li> <li>4. Attempt logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure XX: Testcase Attempt to Delete Booked Slot

<b>Test case</b>	UC03b-06: Cancellation Denied (Less than 2 Hours Before)
<b>Test description</b>	Cancellation is denied when requested less than 2 hours before session start.
<b>Related screens</b>	My Sessions
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Session is booked.</li> <li>2. Current time is less than 2 hours before session.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Session scheduled for 14:00.</li> <li>2. Current time: 12:30 (1.5 hours before).</li> <li>3. Navigate to session.</li> <li>4. Click "Cancel Session"</li> </ol>
<b>Inputs</b>	Session and cancellation request time with gap < 2 hours
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Cancellation denied.</li> <li>2. Error: "Cancellation denied. Sessions must be cancelled at least 2 hours in advance. Please contact your tutor directly."</li> <li>3. Session remains active.</li> <li>4. Denial logged with timestamp.</li> <li>5. Alternative action suggested: "Contact tutor".</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure XX: Testcase Cancellation Denied (Less than 2 Hours Before)

<b>Test case</b>	UC03b-01: Successful Session Booking
<b>Test description</b>	Student successfully books an available consultation slot with matched tutor.
<b>Related screens</b>	My Tutor → Book Session → Confirmation
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Student is authenticated and matched with tutor.</li> <li>2. Tutor has published available slots.</li> <li>3. Slot is not booked.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to "My Tutor" or "Book Session".</li> <li>2. View tutor's available slots.</li> <li>3. Select preferred slot.</li> <li>4. Choose session mode if applicable.</li> <li>5. Click "Book Session" and confirm.</li> </ol>
<b>Inputs</b>	Any available slot from matched tutor, with session mode selection
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Booking confirmed.</li> <li>2. Confirmation: "Session booked successfully".</li> <li>3. Both parties receive notification immediately.</li> <li>4. Session appears in both calendars.</li> <li>5. Slot status = "Booked", no longer available to others.</li> <li>6. Booking logged with timestamp.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

Figure XX: Testcase Successful Session Booking

<b>Test case</b>	UC03b-02: Prevent Double Booking of Same Slot
<b>Test description</b>	System prevents two students from booking the same slot simultaneously.
<b>Related screens</b>	Book Session
<b>Pre-conditions</b>	Student A and B both viewing same available slot.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student B books slot Mon 14:00-16:00.</li> <li>2. Student A (who loaded page earlier) attempts to book same slot.</li> <li>3. Student A clicks "Book Session".</li> </ol>
<b>Inputs</b>	Same available slot accessed by multiple students simultaneously
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System detects slot already booked.</li> <li>2. Booking rejected.</li> <li>3. Error: "This slot has already been booked. Please select another time."</li> <li>4. Student A's booking NOT created.</li> <li>5. Available slots refreshed.</li> <li>6. Conflict logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Prevent Double Booking of Same Slot

<b>Test case</b>	UC03b-03: Booking Confirmation Notification
<b>Test description</b>	Both student and tutor receive immediate notification upon successful booking.
<b>Related screens</b>	Notification System
<b>Pre-conditions</b>	Student successfully books a session, notification system operational.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student books session.</li> <li>2. Check student's notifications/email.</li> <li>3. Check tutor's notifications/email.</li> </ol>
<b>Inputs</b>	Any booked session
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Student receives notification within 2 seconds: "Your session with [Tutor Name] on [Date] at [Time] is confirmed".</li> <li>2. Tutor receives notification within 2 seconds: "[Student Name] has booked a session with you on [Date] at [Time]".</li> <li>3. Session details included in both notifications.</li> <li>4. Notifications logged.</li> </ol>
<b>Testing environment</b>	Web application with notification system

**Figure XX:** Testcase Booking Confirmation Notification

<b>Test case</b>	UC03b-04: 24-Hour Reminder Notification
<b>Test description</b>	Automatic reminder sent 24 hours before scheduled session to both parties.
<b>Related screens</b>	Notification System
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Session is booked.</li> <li>2. Current time is exactly 24 hours before session.</li> <li>3. Automated reminder system running.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Book session for tomorrow at 14:00.</li> <li>2. Wait for 24-hour reminder trigger (or simulate time).</li> <li>3. Check notifications.</li> </ol>
<b>Inputs</b>	Session scheduled 24 hours in the future
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Reminder sent at T-24h to both student and tutor.</li> <li>2. Student: "Reminder: Your session with [Tutor] is in 24 hours ([Date] at [Time])".</li> <li>3. Tutor: "Reminder: Your session with [Student] is in 24 hours ([Date] at [Time])".</li> <li>4. Delivery within 2 seconds.</li> <li>5. Reminder logged.</li> </ol>
<b>Testing environment</b>	Test environment with time simulation

Figure XX: Testcase 24-Hour Reminder Notification

<b>Test case</b>	UC03b-05: Successful Cancellation (More than 2 Hours Before)
<b>Test description</b>	Session can be cancelled when requested at least 2 hours before start time.
<b>Related screens</b>	My Sessions → Cancel Session
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Session is booked.</li> <li>2. Current time is more than 2 hours before session.</li> <li>3. Student is authenticated.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to "My Sessions" or "Upcoming Sessions".</li> <li>2. Select booked session.</li> <li>3. Click "Cancel Session".</li> <li>4. Optionally provide reason: "Schedule conflict".</li> <li>5. Confirm cancellation.</li> </ol>
<b>Inputs</b>	Session and cancellation request time with gap $\geq$ 2 hours
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Cancellation approved.</li> <li>2. Confirmation: "Session cancelled successfully".</li> <li>3. Tutor receives cancellation notification.</li> <li>4. Slot becomes available again.</li> <li>5. Session status = "Cancelled by Student".</li> <li>6. Cancellation logged with reason and timestamp.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure XX: Testcase Successful Cancellation (More than 2 Hours Before)

#### 14.4 Testcase Use-case 4

<b>Test case</b>	UC04a-01: Successfully Submit Complete Feedback
<b>Test description</b>	Student successfully submits complete feedback after a tutoring session.
<b>Related screens</b>	Submit Feedback Form
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Tutoring session has been completed.</li> <li>2. Student is authenticated.</li> <li>3. Feedback has not been submitted yet for this session.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as student.</li> <li>2. Navigate to “Submit Feedback” or view completed sessions.</li> <li>3. Click “Submit Feedback” for completed session.</li> <li>4. Fill all required fields (rating, comments).</li> <li>5. Click “Submit”</li> </ol>
<b>Inputs</b>	Completed session ID, rating value (1-5 scale), and text comments/feedback
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Feedback validated and accepted.</li> <li>2. Success message: “Thank you! Your feedback has been submitted successfully”.</li> <li>3. Feedback stored and linked to session.</li> <li>4. Submission timestamp recorded.</li> <li>5. Feedback status = “Submitted”.</li> <li>6. Data available for aggregated reports.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

Figure XX: Testcase Successfully Submit Complete Feedback

<b>Test case</b>	UC04a-02: Attempt to Submit Without Required Fields
<b>Test description</b>	Feedback submission fails when required fields are missing.
<b>Related screens</b>	Submit Feedback Form
<b>Pre-conditions</b>	Session completed, student is authenticated.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Open feedback form.</li> <li>2. Leave required field(s) empty (e.g., rating).</li> <li>3. Fill optional fields.</li> <li>4. Click “Submit”</li> </ol>
<b>Inputs</b>	Missing required fields (e.g., rating), with or without optional fields filled
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Validation error displayed.</li> <li>2. Error message: “Please fill in all required fields”.</li> <li>3. Required field(s) highlighted in red.</li> <li>4. Feedback NOT submitted.</li> <li>5. User remains on feedback form.</li> <li>6. Can correct and resubmit.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Attempt to Submit Without Required Fields

<b>Test case</b>	UC04a-03: Save Feedback as Draft
<b>Test description</b>	Student can save incomplete feedback as draft for later completion.
<b>Related screens</b>	Submit Feedback Form
<b>Pre-conditions</b>	Session completed, draft functionality available.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Open feedback form.</li> <li>2. Fill some fields (partially complete).</li> <li>3. Click “Save as Draft” or “Save for Later”.</li> </ol>
<b>Inputs</b>	Partially completed feedback data
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Draft saved successfully.</li> <li>2. Message: “Draft saved. You can complete it later.”</li> <li>3. Draft stored with session link.</li> <li>4. Student can return to complete later.</li> <li>5. Draft timestamp recorded.</li> <li>6. Status = “Draft”.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Firefox

**Figure XX:** Testcase Save Feedback as Draft

<b>Test case</b>	UC04a-04: Revise Feedback Within Grace Period (24 hours)
<b>Test description</b>	Student can edit and resubmit feedback within 24-hour grace period.
<b>Related screens</b>	Submitted Feedback → Edit
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Feedback was submitted.</li> <li>2. Less than 24 hours have passed since submission.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student submits feedback at T=0.</li> <li>2. At T=10 hours, student logs in.</li> <li>3. Navigate to submitted feedback.</li> <li>4. Click “Edit” or “Revise Feedback”.</li> <li>5. Modify rating or comments.</li> <li>6. Click “Resubmit”.</li> </ol>
<b>Inputs</b>	Any submitted feedback within 24-hour grace period and modified field values
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Edit option available (within 24h window).</li> <li>2. Previous feedback loads for editing.</li> <li>3. Changes can be made.</li> <li>4. Resubmission successful.</li> <li>5. Updated version replaces original.</li> <li>6. Revision timestamp recorded.</li> <li>7. Message: “Feedback updated successfully”.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Revise Feedback Within 24-Hour Grace Period

<b>Test case</b>	UC04b-01: Successfully Record Student Progress
<b>Test description</b>	Tutor successfully records student progress after a tutoring session.
<b>Related screens</b>	Record Progress Form
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Tutoring session completed.</li> <li>2. Tutor is authenticated.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as tutor.</li> <li>2. Navigate to completed sessions.</li> <li>3. Select specific session.</li> <li>4. Click “Record Progress”.</li> <li>5. Enter progress notes (required).</li> <li>6. Optionally enter session summary.</li> <li>7. Click “Submit”</li> </ol>
<b>Inputs</b>	Completed session ID and progress notes text
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Progress record validated and saved.</li> <li>2. Success message: “Progress recorded successfully”.</li> <li>3. Data stored in database.</li> <li>4. Record linked to session and student.</li> <li>5. Timestamp recorded.</li> <li>6. Available for departmental review.</li> <li>7. Submission logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Successfully Record Student Progress

<b>Test case</b>	UC04b-02: Attempt to Submit Without Required Progress Notes
<b>Test description</b>	Progress cannot be submitted without required notes field.
<b>Related screens</b>	Record Progress Form
<b>Pre-conditions</b>	Session completed, tutor is authenticated.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Open progress recording form.</li> <li>2. Leave required progress notes empty.</li> <li>3. Fill optional summary.</li> <li>4. Click “Submit”</li> </ol>
<b>Inputs</b>	Missing required progress notes field
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Validation error.</li> <li>2. Error: “Progress notes are required”.</li> <li>3. Progress not submitted.</li> <li>4. Form remains editable.</li> <li>5. Required field highlighted.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Attempt to Submit Without Required Progress Notes

<b>Test case</b>	UC04c-01: Successfully Generate Aggregated Report
<b>Test description</b>	Department chair generates aggregated feedback and progress reports.
<b>Related screens</b>	Reports → Aggregated Reports
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Feedback and progress records exist in database.</li> <li>2. Department Chair is authenticated.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as Department Chair.</li> <li>2. Navigate to “Reports” or “Aggregated Reports”.</li> <li>3. Select report type: “Feedback &amp; Progress Overview”.</li> <li>4. Choose criteria (date range, tutor, course).</li> <li>5. Click “Generate Report”.</li> </ol>
<b>Inputs</b>	Any valid date range and department/program filter
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System retrieves relevant data.</li> <li>2. Report generated successfully.</li> <li>3. Displays: average ratings, session counts, feedback submission rate, progress indicators.</li> <li>4. Charts and visualizations included.</li> <li>5. Report displays within 3 seconds.</li> <li>6. Generation logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

**Figure XX:** Testcase Successfully Generate Aggregated Report

<b>Test case</b>	UC04c-02: Filter Report by Date Range
<b>Test description</b>	Reports can be filtered by specific date range for focused analysis.
<b>Related screens</b>	Aggregated Reports
<b>Pre-conditions</b>	Department Chair is authenticated, data exists across multiple time periods.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Navigate to reports.</li> <li>2. Select date filter: “Last 3 months”.</li> <li>3. Generate report.</li> </ol>
<b>Inputs</b>	Any relative or absolute date range filter
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Only data from selected period included.</li> <li>2. Report clearly shows date range.</li> <li>3. Statistics accurate for period.</li> <li>4. Filtering works correctly.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Filter Report by Date Range

<b>Test case</b>	UC04c-03: Export Report to PDF
<b>Test description</b>	Aggregated reports can be exported to PDF for distribution and archival.
<b>Related screens</b>	Report Display → Export
<b>Pre-conditions</b>	Report has been generated, export functionality available.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Generate aggregated report.</li> <li>2. Click “Export to PDF”.</li> <li>3. Download file.</li> <li>4. Open PDF.</li> </ol>
<b>Inputs</b>	Generated report with any valid filter criteria
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. PDF generated successfully.</li> <li>2. PDF includes: all report data, charts, visualizations, metadata.</li> <li>3. PDF well-formatted with department branding.</li> <li>4. Download completes successfully.</li> <li>5. Export action logged.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure XX: Testcase Export Report to PDF

<b>Test case</b>	UC04c-04: No Data Available for Selected Criteria
<b>Test description</b>	System displays appropriate message when no data matches selected criteria.
<b>Related screens</b>	Aggregated Reports
<b>Pre-conditions</b>	Selected criteria has no matching data.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Log in as Department Chair.</li> <li>2. Select very specific filters (e.g., future date range).</li> <li>3. Click “Generate Report”.</li> </ol>
<b>Inputs</b>	Filter criteria that returns no matching records
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. System detects no data.</li> <li>2. Message: “No data available for this selection”.</li> <li>3. Suggestions: “Try different date range” or “Broaden filter criteria”.</li> <li>4. Empty report not generated.</li> <li>5. User can modify criteria.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10

Figure XX: Testcase No Data Available for Selected Criteria

## 14.5 Testcase Use-case 5

<b>Test case</b>	UC05a-01: Generate Departmental Report (Valid Filters)
<b>Test description</b>	The Department Chair generates a departmental report using valid filters and existing data.
<b>Related screens</b>	Reporting → Departmental Report Screen
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User is authenticated as Department Chair.</li> <li>2. Reporting module is available.</li> <li>3. Attendance/performance/session data exists.</li> <li>4. Reporting screen is open.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Open Departmental Report.</li> <li>2. Select filters (term, program).</li> <li>3. Click “Generate”.</li> <li>4. System retrieves and aggregates metrics.</li> <li>5. System displays tables and charts.</li> </ol>
<b>Inputs</b>	Term = Fall 2025, Program = Computer Science
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Report is displayed with correct metrics (attendance, performance, session counts).</li> <li>2. Charts and tables match underlying data.</li> </ol>
<b>Testing environment</b>	Web application on Windows 10, Chrome

**Figure XX:** Testcase Generate Departmental Report (Valid Filters)

<b>Test case</b>	UC05a-02: Change Filters → Report Refresh
<b>Test description</b>	User changes the filters after the report is displayed, and the system refreshes results.
<b>Related screens</b>	Departmental Report Screen
<b>Pre-conditions</b>	A generated report is already visible.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User changes the filter (e.g., change term).</li> <li>2. Click “Apply”.</li> <li>3. System reloads data and refreshes the report.</li> </ol>
<b>Inputs</b>	Term changed from Fall 2025 → Spring 2026
<b>Expected Outputs</b>	Report updates according to the new filters.
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Change Filters → Report Refresh

<b>Test case</b>	UC05a-03: No Data for Selected Criteria
<b>Test description</b>	The selected filters return no matching data, and the system displays an informative message.
<b>Related screens</b>	Departmental Report Screen
<b>Pre-conditions</b>	Database contains no matching records for selected filters.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Select unavailable filters.</li> <li>2. Click “Generate”.</li> </ol>
<b>Inputs</b>	Term = 1999, Program = Computer Science
<b>Expected Outputs</b>	Display message: “No data available for this selection.”
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase No Data for Selected Criteria

<b>Test case</b>	UC05a-04: Export Error (I/O or Size Limit)
<b>Test description</b>	Error occurs when exporting the report due to file size limit or I/O failure.
<b>Related screens</b>	Departmental Report → Export
<b>Pre-conditions</b>	1. Report is generated. 2. System simulates I/O or export size error.
<b>Actions</b>	1. Click “Export → PDF”.
<b>Inputs</b>	Extremely large dataset (mocked)
<b>Expected Outputs</b>	Error message: “Export failed. Narrow scope or retry.” No corrupted file produced; error logged.
<b>Testing environment</b>	Web application with mocked I/O failure

**Figure XX:** Testcase Export Error (I/O or Size Limit)

<b>Test case</b>	UC05a-05: Data Source Unavailable
<b>Test description</b>	Data service or database becomes unavailable while generating the report.
<b>Related screens</b>	Departmental Report Screen
<b>Pre-conditions</b>	Reporting service is offline/mock down.
<b>Actions</b>	Click “Generate”.
<b>Inputs</b>	Any valid filters (with service down)
<b>Expected Outputs</b>	Display message: “Data source unavailable. Please try again later.”
<b>Testing environment</b>	Test environment with mocked service outage

**Figure XX:** Testcase Data Source Unavailable

<b>Test case</b>	UC05b-01: Load Tutor Workload Dashboard (Normal)
<b>Test description</b>	Academic Affairs loads the workload dashboard using valid filters.
<b>Related screens</b>	Workload & Demand Dashboard
<b>Pre-conditions</b>	1. User is authenticated as Academic Affairs. 2. Session/booking data exists. 3. Dashboard module is operational.
<b>Actions</b>	1. Open Dashboard. 2. Select term and department. 3. Click “Load”. 4. System computes and displays workload charts.
<b>Inputs</b>	Term = Fall 2025, Department = Mathematics
<b>Expected Outputs</b>	Workload dashboard displays correct aggregates and charts.
<b>Testing environment</b>	Web app on Windows 10, Firefox

**Figure XX:** Testcase Load Tutor Workload Dashboard (Normal)

<b>Test case</b>	UC05b-02: Drill-down Tutor Details (Alternative)
<b>Test description</b>	User selects a tutor on the dashboard to view detailed workload information.
<b>Related screens</b>	Dashboard → Tutor Detail View
<b>Pre-conditions</b>	Dashboard is displayed with at least one tutor.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Click tutor (e.g., T01).</li> <li>2. System shows session list, hours, and feedback.</li> </ol>
<b>Inputs</b>	Tutor ID = T01
<b>Expected Outputs</b>	Detailed tutor workload is displayed correctly.
<b>Testing environment</b>	Web application on Windows 10

**Figure XX:** Testcase Drill-down Tutor Details (Alternative)

<b>Test case</b>	UC05b-03: No Data for Dashboard
<b>Test description</b>	No matching data exists, and the dashboard cannot be generated.
<b>Related screens</b>	Workload & Demand Dashboard
<b>Pre-conditions</b>	DB has zero matching session/booking records.
<b>Actions</b>	Select empty filters and click “Load”.
<b>Inputs</b>	Term = 1998, Department = Physics
<b>Expected Outputs</b>	Display message: “No data available for this selection.”
<b>Testing environment</b>	Web app on Windows 10

**Figure XX:** Testcase No Data for Dashboard

<b>Test case</b>	UC05b-04: Dashboard Export Error
<b>Test description</b>	Exporting dashboard fails due to size limit or I/O error.
<b>Related screens</b>	Workload Dashboard → Export
<b>Pre-conditions</b>	Mocked I/O or file write failure.
<b>Actions</b>	Click “Export (CSV)”.
<b>Inputs</b>	Large dataset or mocked I/O failure
<b>Expected Outputs</b>	Error message displayed; system suggests narrowing scope or retrying.
<b>Testing environment</b>	Windows 10 + Mock I/O failure

**Figure XX:** Testcase Dashboard Export Error

<b>Test case</b>	UC05b-05: Data Source Unavailable (Dashboard)
<b>Test description</b>	Data service becomes unavailable when loading the dashboard.
<b>Related screens</b>	Workload Dashboard
<b>Pre-conditions</b>	Aggregation or database service is down.
<b>Actions</b>	Click “Load Dashboard”.
<b>Inputs</b>	Any valid filters (service offline)
<b>Expected Outputs</b>	“Service unavailable. Try again later.”
<b>Testing environment</b>	Test environment with mocked outage

**Figure XX:** Testcase Data Source Unavailable (Dashboard)

<b>Test case</b>	UC05c-01: Generate Participation Report (Normal)
<b>Test description</b>	Student Affairs generates a participation report with valid filters and thresholds.
<b>Related screens</b>	Participation Report Screen
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User is Student Affairs.</li> <li>2. Attendance/session data exists.</li> <li>3. Reporting module functional.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Open Participation Report.</li> <li>2. Select term, cohort, threshold.</li> <li>3. Click “Generate”.</li> <li>4. System computes metrics and eligibility.</li> <li>5. System displays results.</li> </ol>
<b>Inputs</b>	Term = Fall 2025, Cohort = 2023, Threshold = 70%
<b>Expected Outputs</b>	Report displays correct participation metrics and eligibility classification.
<b>Testing environment</b>	Windows 10, Chrome

**Figure XX:** Testcase Generate Participation Report (Normal)

<b>Test case</b>	UC05c-02: Adjust Filters / Threshold (Alternative)
<b>Test description</b>	User adjusts threshold or cohort and the report refreshes.
<b>Related screens</b>	Participation Report Screen
<b>Pre-conditions</b>	Report is already displayed.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Change threshold (70% → 80%).</li> <li>2. Click “Apply”.</li> </ol>
<b>Inputs</b>	Threshold = 80%
<b>Expected Outputs</b>	Updated eligibility results according to new threshold.
<b>Testing environment</b>	Windows 10

**Figure XX:** Testcase Adjust Filters / Threshold (Alternative)

<b>Test case</b>	UC05c-03: No Data for Participation Report
<b>Test description</b>	No participation or attendance data found for selected filters.
<b>Related screens</b>	Participation Report Screen
<b>Pre-conditions</b>	Database contains no matching attendance records.
<b>Actions</b>	Select filter with no data and click “Generate”.
<b>Inputs</b>	Term = 1990, Cohort = 1970
<b>Expected Outputs</b>	“No data available for this selection.”
<b>Testing environment</b>	Windows 10

**Figure XX:** Testcase No Data for Participation Report

<b>Test case</b>	UC05c-04: Export Error (Participation Report)
<b>Test description</b>	Export fails due to file size or I/O error.
<b>Related screens</b>	Participation Report → Export
<b>Pre-conditions</b>	Export engine mocked to fail.
<b>Actions</b>	Click “Export → PDF”.
<b>Inputs</b>	Large dataset or simulated I/O failure
<b>Expected Outputs</b>	Error message; suggestion to narrow scope or retry; error logged.
<b>Testing environment</b>	Windows 10 + mocked I/O failure

Figure XX: Testcase Export Error (Participation Report)

<b>Test case</b>	UC05c-05: Data Source Unavailable (Participation Report)
<b>Test description</b>	Data service unavailable when generating participation report.
<b>Related screens</b>	Participation Report Screen
<b>Pre-conditions</b>	Database or aggregation service offline.
<b>Actions</b>	Click “Generate”.
<b>Inputs</b>	Any valid filters (service down)
<b>Expected Outputs</b>	“Data source unavailable. Please try again later.”
<b>Testing environment</b>	Test environment with mocked outage

Figure XX: Testcase Data Source Unavailable (Participation Report)

#### 14.6 Testcase Use-case 6

<b>Test case</b>	UC06a-01: Successful SSO Login
<b>Test description</b>	User successfully logs in via HCMUT_SSO using valid credentials.
<b>Related screens</b>	Login Screen, HCMUT_SSO Portal
<b>Pre-conditions</b>	1. HCMUT_SSO service is online. 2. User has valid credentials.
<b>Actions</b>	1. Click “Login with HCMUT_SSO”. 2. System redirects to SSO portal. 3. User enters valid credentials. 4. SSO validates credentials and returns token. 5. System creates local session and redirects user.
<b>Inputs</b>	Valid username and password
<b>Expected Outputs</b>	User is authenticated and dashboard is displayed.
<b>Testing environment</b>	Windows 10, Chrome, HCMUT SSO staging server

Figure XX: Testcase Successful SSO Login

<b>Test case</b>	UC06a-02: Automatic Single Sign-Out
<b>Test description</b>	Logging out from SSO logs the user out from the system automatically.
<b>Related screens</b>	Dashboard, Login Page
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User authenticated via SSO.</li> <li>2. Active SSO session exists.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User logs out at SSO portal.</li> <li>2. System receives logout callback.</li> <li>3. Local session terminates.</li> </ol>
<b>Inputs</b>	Valid SSO session token
<b>Expected Outputs</b>	User is logged out and returned to login screen.
<b>Testing environment</b>	Browser + SSO session manager

Figure XX: Testcase Automatic Single Sign-Out

<b>Test case</b>	UC06a-03: Invalid or Expired Token
<b>Test description</b>	System must reject login when SSO returns invalid or expired token.
<b>Related screens</b>	Login Screen
<b>Pre-conditions</b>	Token validation enabled.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User initiates SSO login.</li> <li>2. SSO returns invalid/expired token.</li> <li>3. System rejects login.</li> </ol>
<b>Inputs</b>	Invalid or expired token
<b>Expected Outputs</b>	“Invalid token. Please try again.”
<b>Testing environment</b>	Mock invalid-token generator

Figure XX: Testcase Invalid or Expired Token

<b>Test case</b>	UC06a-04: SSO Service Unavailable
<b>Test description</b>	System handles scenario where SSO is offline or unreachable.
<b>Related screens</b>	Login Page
<b>Pre-conditions</b>	SSO endpoint offline.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User selects “Login with HCMUT_SSO”.</li> <li>2. System fails to connect to SSO.</li> </ol>
<b>Inputs</b>	None
<b>Expected Outputs</b>	“HCMUT_SSO is unavailable. Please try again later.”
<b>Testing environment</b>	Simulated SSO outage

Figure XX: Testcase SSO Service Unavailable

<b>Test case</b>	UC06a-05: Network Timeout During SSO Redirect
<b>Test description</b>	Network timeout occurs during redirect to SSO service.
<b>Related screens</b>	Login Screen
<b>Pre-conditions</b>	Slow or unstable network.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User selects SSO login.</li> <li>2. Browser fails to reach SSO endpoint.</li> </ol>
<b>Inputs</b>	None
<b>Expected Outputs</b>	"Unable to reach SSO service."
<b>Testing environment</b>	Network throttling simulator

Figure XX: Testcase Network Timeout During SSO Redirect

<b>Test case</b>	UC06b-01: Successful Synchronization
<b>Test description</b>	System completes synchronization with DATACORE successfully.
<b>Related screens</b>	Admin Sync Logs
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. DATACORE API is online.</li> <li>2. System has scheduled or manual sync enabled.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Sync job starts.</li> <li>2. System retrieves updated profiles and academic data.</li> <li>3. Data is validated and compared with local records.</li> <li>4. Local database updated.</li> </ol>
<b>Inputs</b>	Valid DATACORE API response
<b>Expected Outputs</b>	Local data matches DATACORE; sync logged.
<b>Testing environment</b>	Controlled sync environment with DATACORE test API

Figure XX: Testcase Successful Synchronization

<b>Test case</b>	UC06b-02: Retry with Exponential Backoff
<b>Test description</b>	System retries synchronization when DATACORE API times out.
<b>Related screens</b>	Admin Sync Logs
<b>Pre-conditions</b>	DATACORE API unstable or response delayed.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Sync job begins.</li> <li>2. DATACORE API times out.</li> <li>3. System retries using exponential backoff (1s, 2s, 4s...).</li> <li>4. Sync either succeeds or fails after final retry.</li> </ol>
<b>Inputs</b>	Simulated timeout responses
<b>Expected Outputs</b>	Retry attempts logged; sync succeeds or fails gracefully.
<b>Testing environment</b>	DATACORE timeout simulation

Figure XX: Testcase Retry with Exponential Backoff

<b>Test case</b>	UC06b-03: Invalid Data Format
<b>Test description</b>	System handles malformed or incomplete data returned from DATACORE.
<b>Related screens</b>	Admin Sync Logs
<b>Pre-conditions</b>	Sync job running normally.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. System retrieves malformed JSON.</li> <li>2. Fails data validation.</li> <li>3. Skips affected record.</li> <li>4. Logs validation error.</li> </ol>
<b>Inputs</b>	Malformed DATACORE API record
<b>Expected Outputs</b>	Invalid record skipped; error logged.
<b>Testing environment</b>	Mock DATACORE malformed data feed

**Figure XX:** Testcase Invalid Data Format

<b>Test case</b>	UC06b-04: Sync Failure After All Retries
<b>Test description</b>	System aborts synchronization after failing all retry attempts.
<b>Related screens</b>	Admin Sync Logs
<b>Pre-conditions</b>	DATACORE API fully offline.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Sync job starts.</li> <li>2. All retry attempts fail.</li> <li>3. System aborts sync.</li> <li>4. Error recorded and admin notified.</li> </ol>
<b>Inputs</b>	Continuous timeout/no response
<b>Expected Outputs</b>	Sync aborted; failure logged; alert sent.
<b>Testing environment</b>	DATACORE offline simulation

**Figure XX:** Testcase Sync Failure After All Retries

<b>Test case</b>	UC06c-02: Missing Role Data
<b>Test description</b>	System assigns default “student” role if DATACORE does not return any role for the user.
<b>Related screens</b>	Login Page, Dashboard
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User logged in through SSO.</li> <li>2. DATACORE returns empty or null role data.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. System reads empty role.</li> <li>2. Default “student” role is assigned.</li> <li>3. System logs incident and notifies admin.</li> </ol>
<b>Inputs</b>	Empty role record
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. User assigned “student” role.</li> <li>2. Admin receives notification about missing role.</li> </ol>
<b>Testing environment</b>	DATACORE mock API returning empty role list

**Figure XX:** Testcase Missing Role Data

<b>Test case</b>	UC06c-03: Role Conflict Detected
<b>Test description</b>	System detects conflicting roles from DATACORE and resolves safely.
<b>Related screens</b>	Admin Logs
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. User logs in.</li> <li>2. DATACORE returns conflicting roles (e.g., Tutor + Admin).</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. System reads conflicting roles.</li> <li>2. Conflict is logged for audit.</li> <li>3. System assigns least-privileged role (student) to ensure safety.</li> </ol>
<b>Inputs</b>	Conflicting role list
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Conflict recorded in logs.</li> <li>2. User assigned fallback (student) role.</li> </ol>
<b>Testing environment</b>	Mock API returning two or more conflicting roles

Figure XX: Testcase Role Conflict Detected

<b>Test case</b>	UC06d-01: Successful Resource Linking
<b>Test description</b>	User attaches a library resource to a tutoring session or summary.
<b>Related screens</b>	Session View, Library Search Interface
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Library API is online.</li> <li>2. User has valid access rights.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User searches for a resource.</li> <li>2. System requests metadata from Library API.</li> <li>3. System verifies access rights.</li> <li>4. Resource is attached or opened.</li> </ol>
<b>Inputs</b>	Valid resource ID
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Resource linked successfully.</li> <li>2. Access logged.</li> </ol>
<b>Testing environment</b>	Mock Library API

Figure XX: Testcase Successful Resource Linking

<b>Test case</b>	UC06d-02: Access Denied
<b>Test description</b>	System denies access when user lacks permission for selected resource.
<b>Related screens</b>	Library Access Popup, Session View
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. Resource requires higher privileges.</li> <li>2. User's role does not meet requirements.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User selects restricted resource.</li> <li>2. System checks permissions.</li> <li>3. System denies access.</li> </ol>
<b>Inputs</b>	Restricted resource ID
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Error displayed.</li> <li>2. Event logged.</li> </ol>
<b>Testing environment</b>	Permission-controlled Library API

**Figure XX:** Testcase Access Denied

<b>Test case</b>	UC06d-03: Library Service Unavailable
<b>Test description</b>	Library API is offline or unreachable.
<b>Related screens</b>	Library Search, Session View
<b>Pre-conditions</b>	Library API unavailable.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. User attempts to attach resource.</li> <li>2. System sends API request.</li> <li>3. API does not respond.</li> </ol>
<b>Inputs</b>	Any resource ID
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Message displayed: "Library service unavailable".</li> <li>2. User may retry.</li> <li>3. Event is logged.</li> </ol>
<b>Testing environment</b>	Simulated Library API outage

**Figure XX:** Testcase Library Service Unavailable

#### 14.7 Testcase Use-case 7

<b>Test case</b>	UC07-01: Successful Quiz Generation
<b>Test description</b>	System generates quizzes using course materials and online resources.
<b>Related screens</b>	Quiz Generation Screen
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1. System running.</li> <li>2. Internet connection active.</li> <li>3. AI service online.</li> <li>4. Course has uploaded learning materials.</li> </ol>
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student selects "Generate AI Quiz".</li> <li>2. System retrieves course materials.</li> <li>3. AI processes and analyzes the content.</li> <li>4. Internet search for related academic resources.</li> <li>5. Quiz is generated and displayed.</li> </ol>
<b>Inputs</b>	Course ID with materials
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Quiz displayed on screen.</li> <li>2. Student may download quiz as a file.</li> <li>3. Quiz persists until logout or course completion.</li> </ol>
<b>Testing environment</b>	Browser, AI API mock, stable internet

**Figure XX:** Testcase Successful Quiz Generation

<b>Test case</b>	UC07-02: No Learning Materials
<b>Test description</b>	Course has no materials → system requests manual topic entry.
<b>Related screens</b>	Quiz Generation Screen
<b>Pre-conditions</b>	Course contains zero uploaded learning materials.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student requests quiz generation.</li> <li>2. System detects missing materials.</li> <li>3. System prompts student to manually type key topics.</li> </ol>
<b>Inputs</b>	Empty material repository
<b>Expected Outputs</b>	Message: “No materials found. Please provide topics manually.”
<b>Testing environment</b>	Browser + course with no materials

Figure XX: Testcase No Learning Materials

<b>Test case</b>	UC07-03: Invalid Login
<b>Test description</b>	User not logged in attempts to access AI quiz generation.
<b>Related screens</b>	Login Screen
<b>Pre-conditions</b>	Student session invalid or expired.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student opens quiz generator.</li> <li>2. System checks login token.</li> <li>3. Access denied.</li> </ol>
<b>Inputs</b>	Invalid/expired authentication token
<b>Expected Outputs</b>	Error displayed: “Invalid login. Access denied.”
<b>Testing environment</b>	Browser, expired login session

Figure XX: Testcase Invalid Login

<b>Test case</b>	UC07-04: AI Service Unavailable
<b>Test description</b>	AI engine offline → quiz cannot be generated.
<b>Related screens</b>	Quiz Generation Screen
<b>Pre-conditions</b>	AI API offline or unreachable.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student requests AI quiz.</li> <li>2. System sends request to AI service.</li> <li>3. AI endpoint does not respond.</li> </ol>
<b>Inputs</b>	Any quiz request
<b>Expected Outputs</b>	Error message: “AI service unavailable. Please try again later.”
<b>Testing environment</b>	AI API outage simulation

Figure XX: Testcase AI Service Unavailable

<b>Test case</b>	UC07-05: Internet Connection Lost
<b>Test description</b>	Internet disconnects during quiz generation.
<b>Related screens</b>	Quiz Generation Screen
<b>Pre-conditions</b>	Internet unstable or limited.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. AI processes materials.</li> <li>2. Internet interruption occurs.</li> <li>3. System cannot fetch online resources.</li> </ol>
<b>Inputs</b>	Any request during unstable internet
<b>Expected Outputs</b>	Message: "Internet connection lost. Retry once stable."
<b>Testing environment</b>	Network throttling/offline simulator

Figure XX: Testcase Internet Connection Lost

<b>Test case</b>	UC07-06: Corrupted Course Materials
<b>Test description</b>	Uploaded documents unreadable or corrupted.
<b>Related screens</b>	Course Materials Viewer
<b>Pre-conditions</b>	One or more files unreadable by system or AI.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. System attempts to load course materials.</li> <li>2. Corrupted file detected.</li> <li>3. Affected files are skipped.</li> </ol>
<b>Inputs</b>	Corrupted PDF/Word/text file
<b>Expected Outputs</b>	<ol style="list-style-type: none"> <li>1. Notification: "Some materials cannot be processed."</li> <li>2. Only readable content used for quiz.</li> </ol>
<b>Testing environment</b>	Corrupted file samples

Figure XX: Testcase Corrupted Course Materials

<b>Test case</b>	UC07-07: No Online Academic Resources Found
<b>Test description</b>	AI search returns no usable related academic content.
<b>Related screens</b>	Quiz Generation Screen
<b>Pre-conditions</b>	AI search engine operational but zero results found.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. AI analyzes course materials.</li> <li>2. AI queries search engines.</li> <li>3. Zero relevant results returned.</li> </ol>
<b>Inputs</b>	Course with niche/uncommon topics
<b>Expected Outputs</b>	Message: "No external academic resources found. Using course materials only."
<b>Testing environment</b>	Mock search API returning empty results

Figure XX: Testcase No Online Academic Resources Found

<b>Test case</b>	UC07-08: AI Quiz Generation Timeout
<b>Test description</b>	Quiz generation exceeds allowed processing time.
<b>Related screens</b>	Quiz Loading Screen
<b>Pre-conditions</b>	AI service slow or overloaded.
<b>Actions</b>	<ol style="list-style-type: none"> <li>1. Student starts quiz generation.</li> <li>2. AI begins processing.</li> <li>3. Processing exceeds timeout threshold.</li> </ol>
<b>Inputs</b>	Any quiz request during overload
<b>Expected Outputs</b>	Message: “Quiz generation timed out. Please try again later.”
<b>Testing environment</b>	AI API slowdown simulation

**Figure XX:** Testcase AI Quiz Generation Timeout

## 15 System Integration

- **HCMUT\_SSO:** OAuth2/OIDC-based single sign-on.
- **HCMUT\_DATACORE:** Read-only sync of personal data (name, ID, role, faculty, email).
- **HCMUT\_LIBRARY:** Link and share official materials within sessions.

## 16 Coding Rules and Constraints

To align with prior functional-programming constraints used in course assignments, if applicable:

- Only allowed imports per assignment rules.
- Prefer pure functions; avoid global state.
- Prefer higher-order functions and list comprehensions over loops.
- Single-assignment variables within functions to encourage immutability.

(Adapt or remove this section if your instructor does not require functional-programming constraints.)

## 17 Submission and Deliverables

### Deliverables:

- PDF generated from this L<sup>A</sup>T<sub>E</sub>X project.
- Any supporting diagrams (PNG/PDF) in the `images/` folder.

### Submission notes:

- Ensure the document compiles on Overleaf without custom fonts or non-standard packages.

## 18 Other Regulations

- Work must be original and comply with academic integrity policies.
- Instructor decisions are final.
- Post-grading test cases or rubrics may be summarized but not fully disclosed.

## 19 Changelog

Version	Notes
1.0	Initial draft tailored for Tutor Support System ( 26 September 2025).
1.1	Functional Requirement, Non-Functional Requirement and General Use-case diagram (24 September 2025).
1.2	Detail Use-case diagram and Table, Non-Interactive Functional Requirement and Fix 1.1 log submission(01 October 2025).
2.0	Complete State, Activity, Sequence and Mockup diagrams (01 November 2025).
3.0	Complete Development, Class, Test case, Deployment diagrams (17 November 2025).