FAST NUCES, Islamabad

# SOFTWARE DESIGN & ANALYSIS

## Deliverable #3


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# University Bus Management System

Enhancing Efficiency and Safety in Student Transportation

## USE CASE DIAGRAM:

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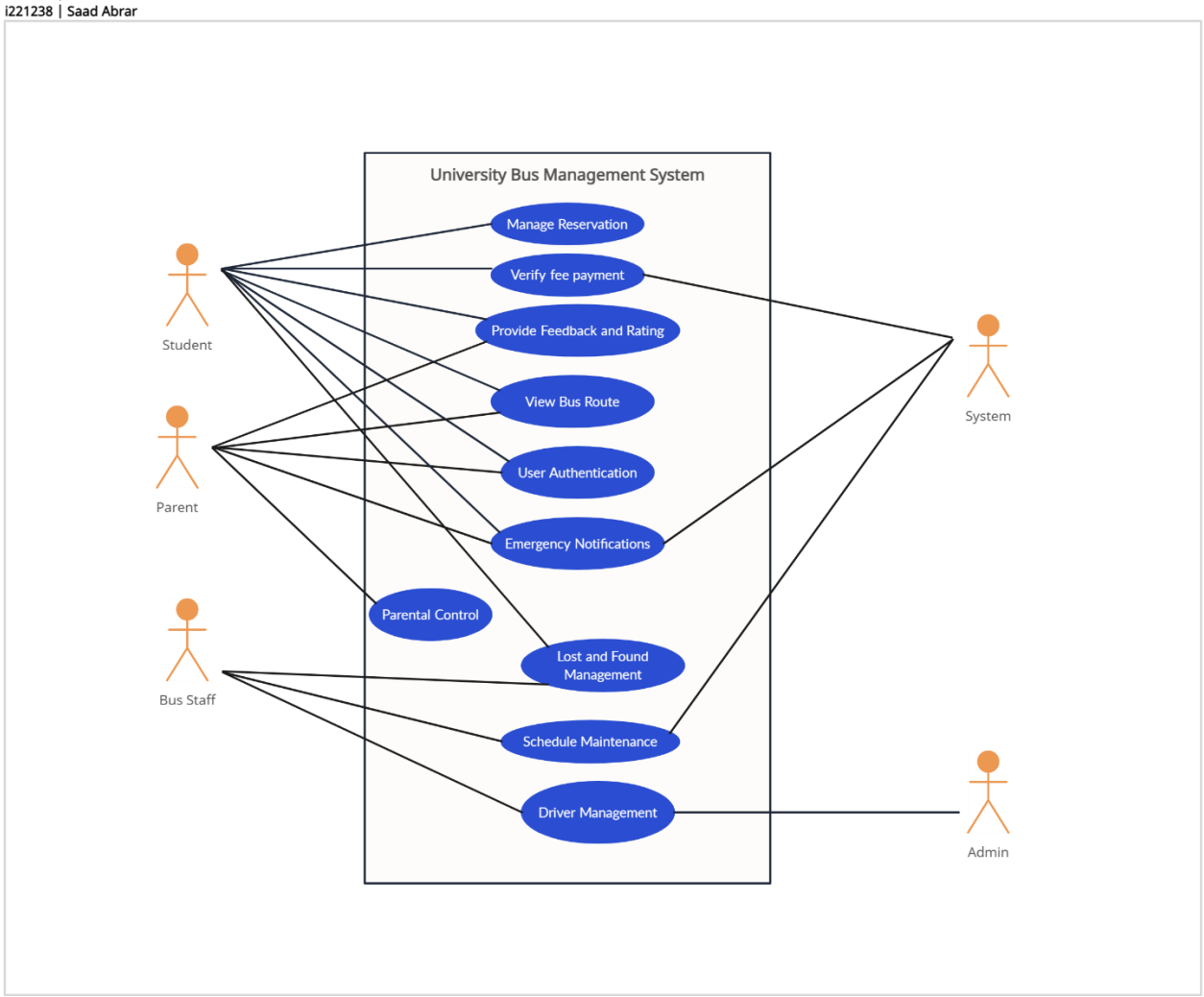

## 1. USER AUTHENTICATION (Areeba Riaz)

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|---|---|
| **Use case name:** | User Authentication. |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Student, Parent. |
| **Stakeholders and interests:** | **Student:** Needs secure access to bus routes, schedules, and reservations.<br>**Parent:** Needs to track the child's bus location in real-time for safety and convenience.<br>**University:** Ensures only authorized access to the system and user data protection. |
| **Preconditions:** | - User is at the login/registration screen.<br>- If registering, the user has required details (name, email, contact number).<br>- If logging in, the user must have valid credentials (username and password). |
| **Postconditions:** | - Successful login gives the user access to the dashboard.<br>- Failed login shows an error message or, if registration failed, prompts for corrections. |

**Main success scenario**

| Actor Action | System Responsibility |
|---|---|
| 1. User selects "Login" or "Register." | |
| 2. User enters login credentials (for existing accounts)<br>or provides personal details (for new accounts). | |
| | 3. System verifies user input (credentials or new registration details). |
| | 4. For login: If valid, the system grants access to the user's dashboard. |
| | 5. For registration: System creates a new account and logs the user in automatically. |

**Extensions**

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| 1a. Invalid credentials: System displays an error message ("Invalid username or password") and prompts the user to retry or reset the password. |
| 2a. Failed registration: System displays an error (e.g., "Email already registered") and asks for corrections. |
| 3a. Account locked: After multiple failed login attempts, the system locks the account for security reasons, requiring the user to contact support. |

## 2. VIEW BUS ROUTES (Saad Abrar)

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|---|---|
| **Use case name:** | View Bus routes. |
| **Scope:** | University Bus Management System |
| **Level:** | User Goal |
| **Primary actor:** | Student, Parent |
| **Stakeholders and interests:** | **Student:** Need to know which bus route to take based on schedule and location.<br>**Parent:** Needs to view the route to ensure their child's safety during travel. |
| **Preconditions:** | User is logged in.<br>Bus route data is available in the system. |
| **Postconditions:** | Bus routes are displayed with all relevant information. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. User selects "View Bus Routes" . | |
| | 2. System retrieves available bus routes. |
| | 3. System displays the list of routes. |
| 4. User selects a specific route to view detailed information. | |
| | 5. System highlights relevant routes. |
| 6. User plans their journey. | |
| **Extensions** | |
| 1a. User is not logged in.<br>Action: System redirects the user to the login screen | |
| 2a. Route updates or changes in real time.<br>Action: The system updates the route information with a message like, "This route has been updated. Please check the new details. | |
| 3a. If there are no bus routes available, the system displays a message such as, "No bus routes are currently available. Please check again later." | |
| 4a. If the system encounters a failure while retrieving routes, it will display an error message such as "Unable to load bus routes at this time," and prompt the user to try again later. | |

## 3. MANAGE RESERVATION (Saad Abrar)

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|---|---|
| **Use case name:** | Manage Reservation. |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Student. |
| **Stakeholders and interests:** | **Student:** Needs to reserve or cancel a seat for upcoming journeys. |
| **Preconditions:** | User is logged in.<br>Student has the access to bus reservations. |
| **Postconditions:** | Reservation is created or updated, and confirmation is sent to the student. |

**Main success scenario**

| Actor Action | System Responsibility |
|---|---|
| 1. The student logs into the system and navigates to the "Manage Reservation" section. | |
| | 2. The system displays available bus routes and the current seat availability for upcoming journeys. |
| 3. The student selects their preferred route, along with the desired date and time for travel. | |
| | 4. The system verifies seat availability, confirms the reservation, and displays a confirmation message with details like bus route, departure time, and seat number. |
| 4. After the confirmation, the student can review the reservation details.They can also modify their reservation if required. | |

**Extensions**

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| 1a. If no seats are available for the selected route, the system will notify the student and prompt them to select a different time or bus route. |
| 2a. If the student selects an invalid date or time, the system will alert them to make a valid selection. |
| 3a. In the event that the student already has a reservation for the same date and time, the system will inform them and offer options to modify or cancel the existing reservation. |
| 4a. If the system detects unpaid fees, it will block the reservation and direct the student to complete the payment. |

## 4. VERIFY FEE PAYMENT (Saad Abrar)

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|---|---|
| **Use case name:** | Verify Fee Payment. |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Student. |
| **Stakeholders and interests:** | **Student:** Needs to verify payment status to ensure eligibility for bus reservations and to avoid issues with seat bookings. |
| **Preconditions:** | User is logged in.<br>Student has initiated a transaction for payment of bus fees. |
| **Postconditions:** | Payment status is verified, and the student is informed whether they can proceed with the reservation or if further action is needed. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. The student logs into the system and navigates to the "Payment" section to verify their fee payment status. | |
| | 2. The system retrieves the student's payment history and displays the current status of any pending or completed payments. |
| 3. The student selects the specific payment transaction they wish to verify. | |
| | 4.. If the payment is confirmed as successful, the system displays a confirmation message indicating that the student has paid all necessary fees and can proceed with bus reservations. |
| **Extensions** | |
| 1. If the payment is pending or not found , the system will notify the student that their payment has not been completed. | |
| 2. If the student attempts to verify payment without initiating any payment transaction. The system will inform the student that there are no payment records available to verify. | |
| 3. If the payment verification process encounters a system error, The system will display an error message | |

## 5. PARENTAL CONTROL (Saad Abrar)

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|---|---|
| **Use case name:** | Parental Control |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Parent. |
| **Stakeholders and interests:** | **Parent:** Wants to track their child's bus journey to ensure their safety and timely arrival.<br>**University Administration:** Aims to provide parents with peace of mind and enhance the safety of students. |
| **Preconditions:** | User is logged in.<br>The child has a valid bus reservation.<br>The tracking feature is enabled for the child's account. |
| **Postconditions:** | The parent receives real-time updates regarding their child's bus journey.<br>The system logs tracking history for future reference. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. The parent logs into the system and navigates to the "Parental Tracking" section. | |
| | 2. The system displays a list of their children who have active bus reservations. |
| 3. The parent selects their child from the list. | |
| | 4. The system retrieves the selected child's current bus journey details. |
| 5. The parent can choose to receive alerts via SMS or email regarding the journey status. | |
| | 6. System allows the parent to review the tracking history for the day, including timestamps for stops and travel times. |
| **Extensions** | |
| 1a. If the selected child does not have an active reservation, The system notifies the parent that there are no active journeys to track. | |
| 2a. f the tracking feature is temporarily unavailable, The system notifies the parent of the issue. | |
| 3a. If the parent wishes to see the most recent update,The parent can manually refresh the tracking data. | |
| 4a. If the bus encounters an emergency situation, The system sends an automatic notification to the parent. | |

## 6. EMERGENCY NOTIFICATIONS (Saad Abrar)

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|---|---|
| **Use case name:** | Emergency Notifications |
| **Scope:** | University Bus Management System |
| **Level:** | User Goal |
| **Primary actor:** | System Administrator |
| **Stakeholders and interests:** | **System Administrator:** Ensures that emergency protocols are in place and that notifications are sent out promptly**.**<br>**Bus Driver:** Responsible for reporting emergencies and ensuring passenger safety.<br>**Students:** Need to be informed about emergencies to ensure their safety.<br>**Parents:** Want timely notifications regarding their child's safety during emergencies. |
| **Preconditions:** | The bus is operational.<br>The occurance of emergency situation.<br>Emergency protocols are established. |
| **Postconditions:** | Relevant notifications are sent to students and parents.<br>Emergency information is logged for future reference and analysis. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. The bus driver reports an emergency using the emergency button or app. | |
| | 2. The system logs the incident and triggers the emergency notification protocol. |
| | 3. Alerts are sent to all students on the bus and their parents, providing instructions and confirming the students' safety. |
| | 4. The system allows students and parents to contact the university's emergency hotline for more information. |
| **Extensions** | |
| 1a. **Communication failure**: The system retries sending notifications through alternative methods. | |
| 2a. **Parent opt-out**: Notifications are not sent to parents who opted out, but this is logged. | |
| 3a. **Post-incident report**: After resolution, the system generates a detailed report for review. | |

## 7. Feedback and Rating System (Areeba Riaz)

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|---|---|
| **Use case name:** | Feedback and Rating System |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Student, Parent. |
| **Stakeholders and interests:** | **Student:** Wants to give feedback to improve bus schedules and services.<br>**Parent:** Wants to provide input on service reliability and safety concerns.<br>**University:** Needs feedback to monitor service quality and make improvements. |
| **Preconditions:** | - The user is logged into the system.<br>- The feedback interface is available after using the bus service. |
| **Postconditions:** | - Feedback is stored in the system for review by the administration.<br>- Ratings are recorded and displayed for service quality analysis. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. User navigates to the feedback and rating section of the system. | |
| | 2. The system prompts the user to rate the service and provide written feedback. |
| 3. User enters their rating (e.g., 1-5 stars) and feedback. | |
| | 4. System validates the input and submits the feedback. |
| | 5. The system confirms successful submission and stores the feedback for review. |
| **Extensions** | |
| 1a. **Bus service not used**: The system restricts access to feedback for users who have not used the service within the last week. | |
| 2a. **Incomplete submission**: The system alerts the user if they fail to fill in required fields and prompts them to complete the submission. | |
| 3a. **Network issues**: If there is a network problem, the system saves the feedback locally and prompts the user to retry later.. | |

## 8. Lost and Found System (Areeba Riaz)

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|---|---|
| **Use case name:** | Lost and Found System |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Student, Bus Staff |
| **Stakeholders and interests:** | **Student:** Wants to report lost items and track their status.<br>**Bus Staff:** Needs to manage reported items and assist students in recovering lost belongings.<br>**University:** Wants to ensure efficient management of lost items to provide better services. |
| **Preconditions:** | - The user (Student or Bus Staff) is logged into the system.<br>- The bus journey where the item was lost has already been completed. |
| **Postconditions:** | - Lost item is recorded and tracked in the system.<br>- Updates regarding item status are available to students. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. Student navigates to the Lost and Found section and reports a lost item. | |
| | 2. The system prompts the student to describe the lost item (e.g., description, bus route, date). |
| 3. Student submits the report. | 3. System submits the report and notifies the bus staff. |
| 4. Bus staff review the lost item report and mark it as "under investigation." | |
| 5. If found, bus staff update the item status as "found," and the student is notified to collect it. | |
| **Extensions** | |
| 1a. **Item already found**: The system notifies the student if the item has already been reported or found by bus staff. | |
| 2a. **Incomplete details**: If the student provides insufficient details, the system requests further information before submission. | |
| 3a. **Bus Staff unavailable**: The system informs the student of delays if no bus staff are available to address the lost item immediately. | |
| 4a. **Item not found:** If the item is not recovered after a set time, the system notifies the student that the search has been closed. | |

## 9. Schedule Maintenance (Areeba Riaz)

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|---|---|
| **Use case name:** | Schedule Maintenance |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Bus Staff |
| **Stakeholders and interests:** | **Bus Staff:** Needs to ensure buses are regularly maintained for safety and efficiency.<br>**System:** Must track and manage maintenance schedules to avoid disruptions in bus services.<br>**University:** Ensures bus reliability and reduces downtime by maintaining bus fleets. |
| **Preconditions:** | - Bus staff is logged into the system.<br>- Maintenance records and schedules for the buses are up to date. |
| **Postconditions:** | - Maintenance schedule is updated in the system.<br>- System sends notifications for upcoming maintenance. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. Bus staff logs into the system and navigates to the maintenance schedule module. | |
| | 2. The system displays the list of buses and their current maintenance status. |
| 3. Bus staff selects a bus and schedules a new maintenance activity by providing details such as maintenance type, date, and duration. | |
| | 4. System updates the maintenance schedule and sends notifications to bus staff for upcoming maintenance tasks. |
| | 5. Maintenance records are stored for future reference. |
| **Extensions** | |
| 1a. **Insufficient details**: The system prompts bus staff for any missing required details (e.g., date, type of maintenance) before scheduling. | |
| 2a. **Maintenance conflict**: If a maintenance schedule conflicts with another service or bus trip, the system alerts the bus staff to resolve the conflict. | |
| 3a. **Bus unavailable**: If the bus is unavailable for maintenance on the selected date, the system suggests alternative dates. | |
| 4a. **Last-minute changes**: The system allows bus staff to reschedule maintenance activities in case of urgent requirements. | |

## 10. Driver Management (Areeba Riaz)

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|---|---|
| **Use case name:** | Driver Management |
| **Scope:** | University Bus Management System. |
| **Level:** | User Goal. |
| **Primary actor:** | Admin |
| **Stakeholders and interests:** | **Admin:** Needs to assign drivers to buses, manage schedules, and track performance for safety and efficiency.<br>**Bus Staff:** Requires updated assignments and schedules for smooth operations.<br>**University:** Ensures reliable bus services by managing qualified drivers. |
| **Preconditions:** | - Admin is logged into the system.<br>- Driver records are up to date in the system database. |
| **Postconditions:** | - Driver information, including schedules and assignments, is updated in the system.<br>- Performance tracking data is stored for future reference. |
| **Main success scenario** | |
| **Actor Action** | **System Responsibility** |
| 1. Admin logs into the system and navigates to the Driver Management module. | |
| | 2. The system displays a list of drivers, including their current assignments and schedules. |
| 3. Admin selects a driver to update their assignment or schedule, providing necessary details like route and time. | |
| 4. Admin can view and track the performance of drivers based on criteria such as punctuality and safety records. | |
| | 5. System updates the driver assignment, schedule, and performance data, notifying the bus staff of any changes. |
| **Extensions** | |
| 1a. **Missing driver details**: The system prompts the admin to enter any missing information (e.g., driver license, certifications). | |
| 2a. **Conflicting schedules**: If a driver is already assigned to another bus or task, the system alerts the admin to resolve the conflict. | |
| 3a. **Driver unavailability**: The system checks for driver availability and suggests alternative drivers if the selected driver is unavailable. | |
| 4a. **Performance issues**: If performance data indicates issues (e.g., frequent lateness), the system flags the driver for review by the admin. | |