LABORATORY

Equipment Management System

User Manual

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1. GETTING STARTED

LabEMS (Laboratory Equipment Management System) is a comprehensive web-based system designed to streamline the management of laboratory equipment, bookings, maintenance schedules, and user administration. The system provides role-based access control, automated conflict detection, email notifications, and detailed audit tracking.

This user manual covers how to use LabEMS from an end-user and administrator perspective. It explains common workflows, available pages and actions, and provides troubleshooting tips.

PREREQUISITES FOR ACCESS

Requirements	Details
Account	You must have a valid user account to access the system and book equipment.
Site Access	Contact your system administrator if the site is restricted.
Browser	A modern web browser is recommended (Chrome 90+, Firefox 88+, Edge 90+, Safari 14+).
Internet	A stable internet connection is required for real-time features.
Email	A valid email address is needed for notifications and account management.
JavaScript	JavaScript must be enabled for interactive features.

SYSTEM ACCESS AND FIRST TIME SETUP

Production URL: Access the application in your browser at: https://labems-a3cjf7e7d8e8czfd.southafricanorth-01.azurewebsites.net/login.html

FIRST TIME SETUP:

- 1. Contact your system administrator to request an account activation.
- 2. You will receive a welcome email with your login credentials.
- 3. Use your university email address as your username.
- 4. Change your password on first login (recommended).
- 5. Complete your profile information.

LOGGING IN

- 1. Open the login page.
- 2. Enter your email (username) and password, then submit.
- 3. On success, you'll be redirected to the main dashboard.

2. USER ROLES AND PERMISSIONS

LabEMS implements role-based access control to ensure secure and appropriate system usage. There are two primary user roles: **Student** and **Administrator**. Roles are assigned during account creation or updated by an administrator.

STUDENT ROLE

Access Capabilities:

- View the equipment catalogue and check availability.
- Create and manage personal equipment bookings.
- Review booking history and current booking status.
- Update personal profile information.
- Receive system-generated email notifications.

Restrictions:

- No access to administrative features.
- Limited to managing personal bookings only.
- Cannot modify user accounts or system configurations.

ADMINISTRATOR ROLE

Administrators have full access to all system features and functions.

Administrative Capabilities:

- Equipment Management: Add, update, and delete equipment records.
- User Management: Create, modify, and deactivate user accounts.
- Booking Management: View, edit, and manage all bookings.
- Maintenance Management: Schedule and monitor equipment maintenance.
- Audit Logs: Access detailed logs of system activity.
- Reporting: Generate and export reports with advanced filtering options.

3. TECHNICAL SPECIFICATIONS

SYSTEM ARCHITECTURE

Component	Technology / Detail	Description
Frontend	JavaScript, Lit components, Vite build system	The user interface developed using modern web technologies and a fast build system.
Backend	ASP.NET Core Web API, Entity Framework	The server-side logic and API layer, utilising a robust framework for development and ORM for database interaction.
Database	MySQL	The relational database system, featuring comprehensive data modelling for equipment, users, and bookings.
Authentication	JWT (JSON Web Token)	Secured token-based authentication with role-based access control implemented.
Email Service	Integrated SMTP service	Used for sending automated notifications and managing account communications.

SECURITY FEATURES

Feature	Mechanism / Protocol	Purpose
Authentication	JWT-based token authentication	Ensures secure session management and verification of user identity.
Password Protection	BCrypt hashing	Encrypts user passwords before storage to prevent plaintext exposure.
Access Control	Role-Based Access Control (RBAC)	Enforces strict user permissions based on assigned roles.
Audit Logging	Activity Logging	Logs all user and system activities for monitoring, accountability, and forensic analysis.
Data Transmission	HTTPS/TLS protocols	Encrypts all data transmitted between the client and server.
Session Management	Automatic logout, 24-hour expiration	Mitigates risks from unattended or stale sessions by enforcing timeouts and expiration.

4. STUDENT USER GUIDE

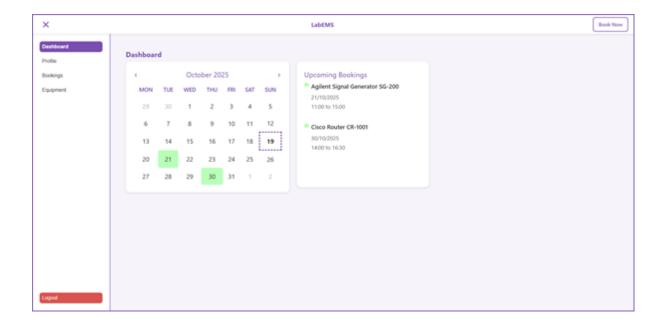
Students have limited access within the LabEMS system. The following workflow outlines how a student typically interacts with the system.

4.1. STUDENT DASHBOARD

After logging in, students are directed to the **Dashboard**, which provides a clear overview of key system information, including:

- A calendar displaying upcoming equipment bookings
- A summary of Upcoming bookings

This dashboard helps students stay informed about their scheduled activities and manage their bookings efficiently.

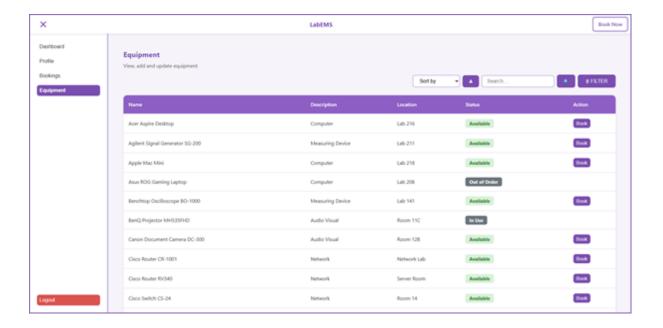


4.2. BROWSING EQUIPMENT

To view available laboratory equipment and check its current status:

- 1. Navigate to the **Equipment** page within the LabEMS interface.
- 2. Use the built-in filter options to refine the equipment list by name, availability status, or location.

This allows users to quickly locate the equipment they need and determine whether it is ready for booking, currently in use, under maintenance, or otherwise unavailable.



Equipment Status Indicators:

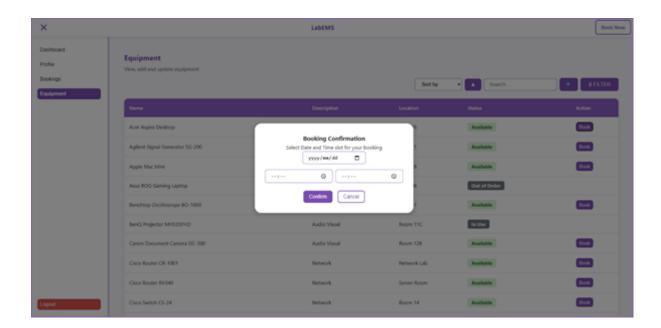
- Available: The equipment is ready to be booked.
- In Use: The equipment is currently booked by another user.
- Under Maintenance: The equipment is temporarily unavailable due to scheduled maintenance.
- Out of Order: The equipment is non-functional and requires repair or has been decommissioned.
- Reserved: The equipment has been set aside for future use.

4.3. CREATING A BOOKING

To book laboratory equipment:

- 1. Navigate to the **Equipment** page and confirm that the desired item is available.
- 2. If the equipment is available, a **Book** button will appear in the **Action** column.
- 3. Click the **Book** button to open the booking form.
- 4. Select the desired date and specify the start and end times.
- 5. Click **Confirm** to submit the booking request.

Upon successful submission, you will receive an on-screen confirmation and an email notification. The system automatically prevents overlapping bookings to ensure fair access.

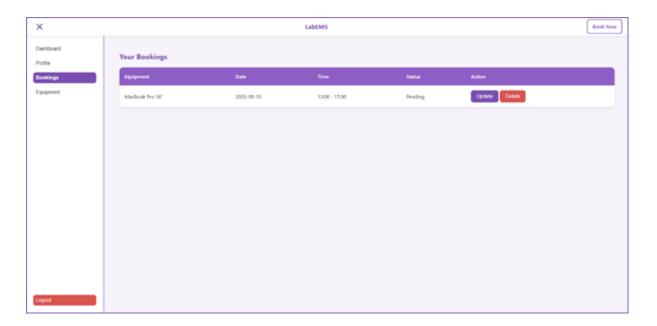


4.4. VIEWING YOUR BOOKINGS

To view your upcoming and past equipment bookings:

- 1. Navigate to the **Bookings** page.
- 2. The page displays a list of all your bookings, including relevant details and current status.

This section helps users track their booking history and monitor the status of each booking efficiently.



Booking Status Definitions

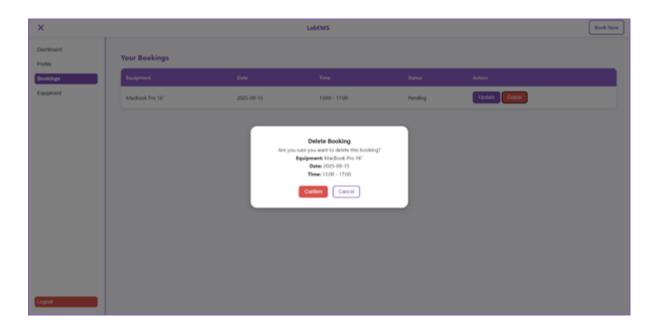
- Pending: The booking request has been submitted and is awaiting approval.
- Approved: The booking has been confirmed and is scheduled.
- Rejected: The booking request was declined by an administrator.
- Cancelled: The booking was cancelled either by the user or an administrator.
- Completed: The booking period has ended successfully.

4.5. CANCELLING A BOOKING

To cancel an existing equipment booking:

- 1. Go to the **Bookings** page and locate the booking you wish to cancel.
- 2. Click the **Delete** button next to the booking entry.
- 3. Review the booking details and click **Confirm** to proceed with the cancellation.

The system will update the booking status to Cancelled and send a confirmation email to your registered address.

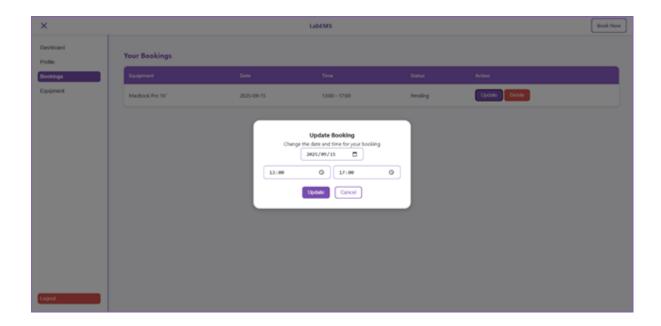


4.6. UPDATING A BOOKING

To modify an existing equipment booking:

- 1. Navigate to the **Bookings** page and locate the booking you wish to update.
- 2. Click the **Update** button to open the booking form.
- 3. Adjust the booking date and start/end times as needed.
- 4. Click **Update** again to submit the changes.

If the updated booking overlaps with an existing booking, it will require administrator approval before confirmation.

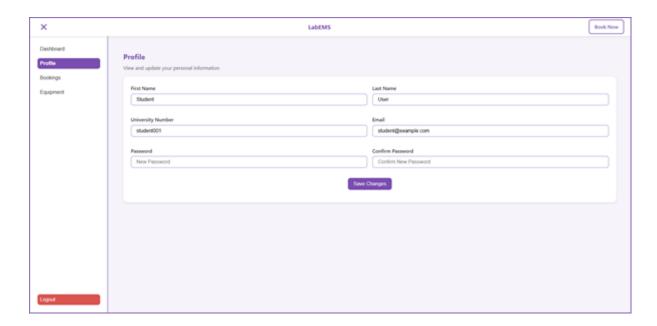


4.7. PROFILE MANAGEMENT

To update your personal profile information:

- 1. Navigate to the **Profile** page.
- 2. Modify the editable fields, such as your email address and password.
- 3. Click **Save Changes** to apply and confirm your changes.

Keeping your profile information up to date ensures accurate communication and system notifications.



5. ADMINISTRATOR GUIDE

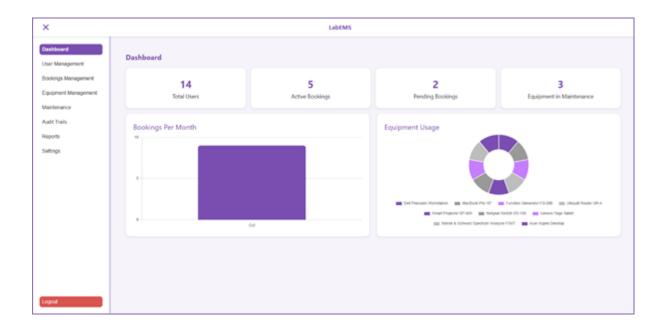
Administrators have full access to all features and functions within the LabEMS system. This includes complete control over equipment records, user accounts, booking management, maintenance scheduling, audit logs, and report generation.

5.1. ADMINISTRATOR DASHBOARD

Upon logging in, administrators are directed to the **Dashboard**, which provides a comprehensive overview of key system metrics. These include:

- Total number of registered users
- Equipment usage statistics
- Maintenance status of equipment
- Booking activity and trends

This centralised view enables administrators to monitor system performance and make informed decisions efficiently.

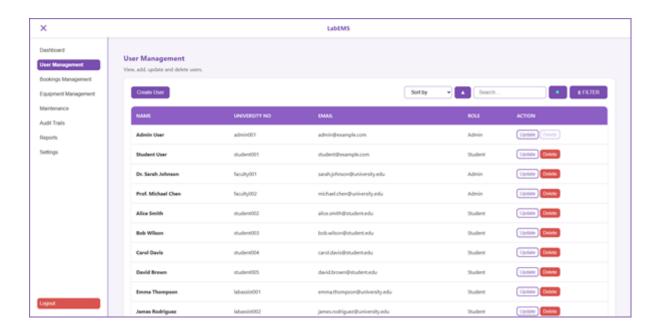


5.2. USER MANAGEMENT

Administrators can manage user accounts through the **User Management** page. Available actions include:

- View and Search Users:
 Locate users by name, email, or role using the search functionality.
- Add or Update User Details:
 Create new accounts or modify existing user information, including names and contact information.
- Reset Passwords:
 Initiate password resets for users who require credential updates.
- Remove Users:
 Permanently delete user accounts from the system when necessary.

These tools ensure administrators can maintain accurate and secure user records across the system

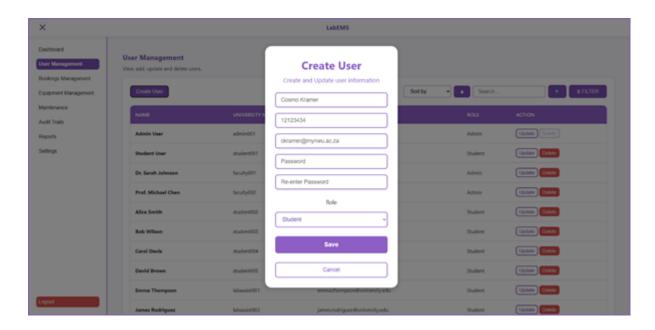


5.2.1. CREATE NEW USER ACCOUNT

To add a new user to the system:

- 1. Navigate to the User Management page.
- 2. Click Create User.
- 3. Enter the required information: full name, student number, email address, and assigned role.
- 4. Click **Save** to complete the process.

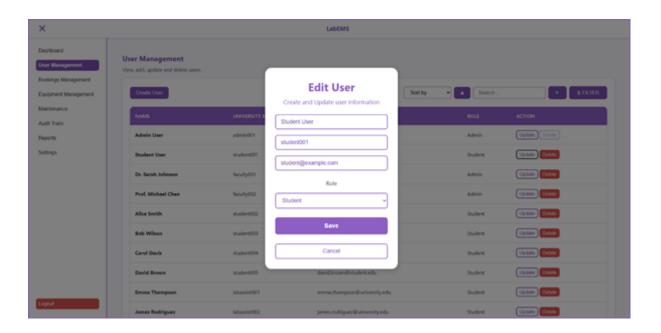
Once saved, the user will receive an email containing their login credentials.



5.2.2. UPDATE USER DETAILS

To modify an existing user account:

- 1. Navigate to the User Management page.
- 2. Locate the user using the search function if necessary.
- 3. Click **Update** next to the user's name.
- 4. Edit the required fields, such as full name, student number, email address, or assigned role.
- 5. Click **Save** to apply the changes.

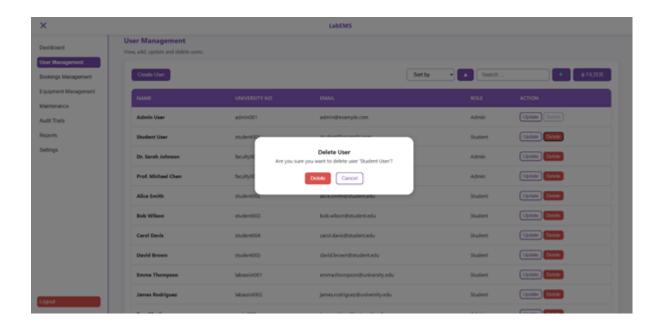


5.2.3. DELETE USER DETAILS

To permanently remove a user from the system:

- 1. Navigate to the User Management page.
- 2. Locate the user using the search function if necessary.
- 3. Click the **Delete** button next to the user's name.
- 4. Confirm the user's identity.
- 5. Click **Delete** again to finalize the removal.

This action will permanently delete the user's account and associated access rights.

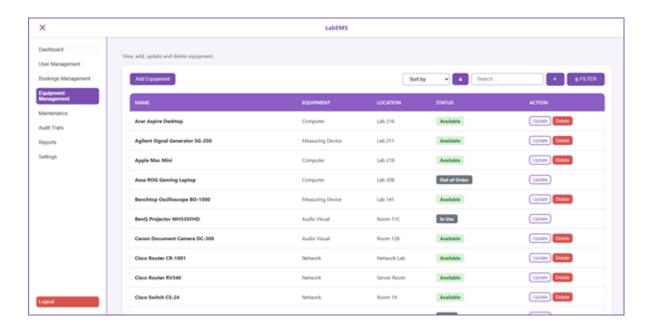


5.3. EQUIPMENT MANAGEMENT

Administrators can manage equipment records through the **Equipment Management** page. Available actions include:

- Add Equipment
- Update Equipment
- Delete Equipment

These functions ensure accurate tracking and availability of laboratory equipment across the system.

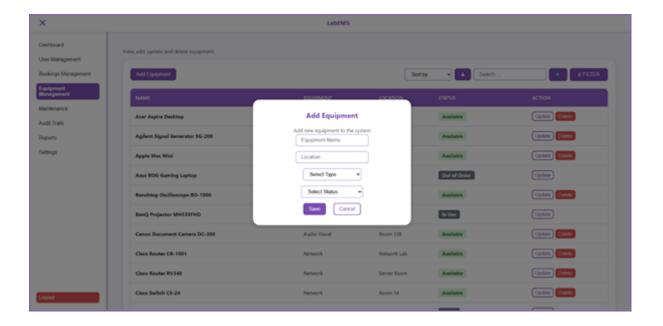


5.3.1. ADD EQUIPMENT

To register new equipment in the system:

- 1. Click Add Equipment on the Equipment Management page.
- 2. Enter all required details, including:
 - Name of the equipment
 - Type or category
 - Location within the facility
 - Status (e.g., Available, Under Maintenance)
 - Description outlining its purpose or specifications
- 3. Click **Save** to complete the registration.

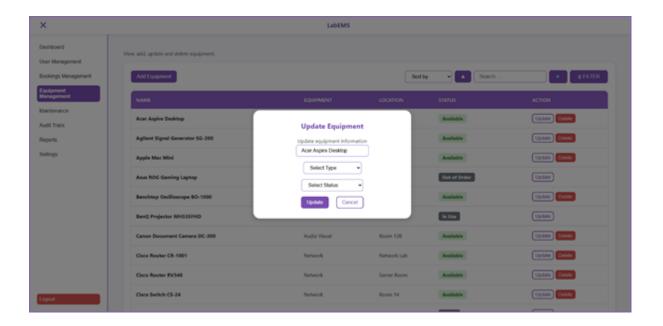
This process ensures that new equipment is accurately recorded and made available for booking and tracking within the LabEMS system.



5.3.2. UPDATE EQUIPMENT

To modify existing equipment information:

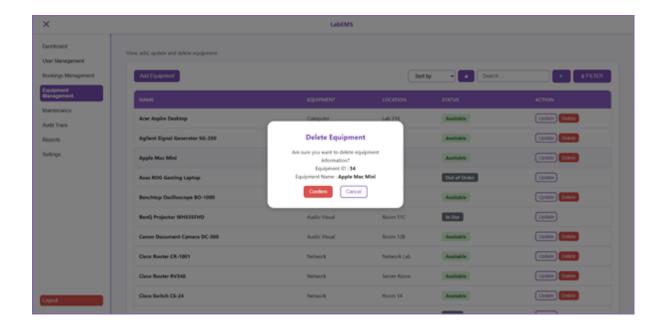
- 1. Navigate to the Equipment Management page.
- 2. Locate the equipment item (use the search function if necessary).
- 3. Click **Update** in the Action column.
- 4. Edit the necessary fields such as name, type, location, or status.
- 5. Click **Save** to apply the changes.



5.3.3. DELETE EQUIPMENT

To permanently remove equipment from the system:

- 1. Navigate to the Equipment Management page.
- 2. Locate the equipment item (use the search function if necessary).
- 3. Click **Delete** in the Action column.
- 4. Review the equipment details for confirmation.
- 5. Click **Confirm** to finalize the deletion



5.4. EQUIPMENT MAINTENANCE

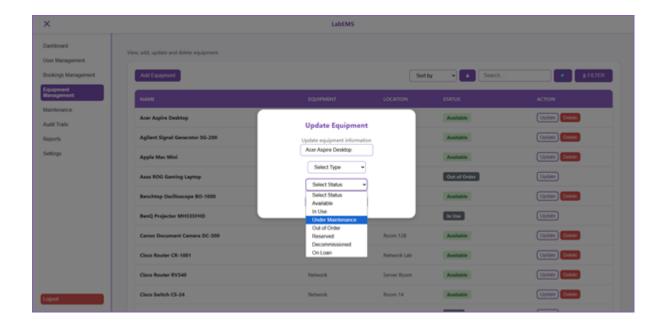
Administrators can manage equipment maintenance through the **Equipment Management** page by updating the status of items as needed. While equipment is marked as Under Maintenance, it is unavailable for booking until restored by an administrator.

5.4.1. SCHEDULE EQUIPMENT MAINTENANCE

To mark equipment as under maintenance:

- 1. Navigate to the **Equipment Management** page.
- 2. Locate the equipment item (use the search function if necessary).
- 3. Click **Update** next to the item.
- 4. Change the status to **Under Maintenance**.
- 5. Click **Update** to confirm.

The equipment will be moved to the Maintenance list and will remain unavailable for booking until its status is updated.

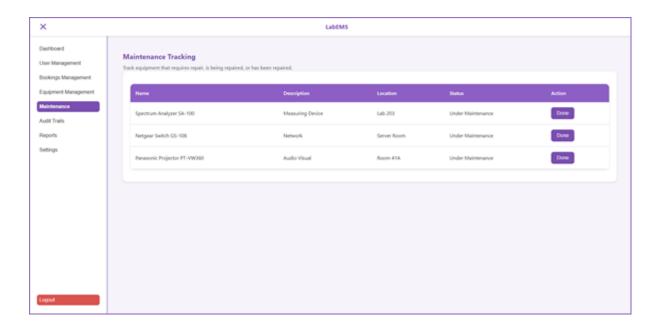


5.4.2. COMPLETE MAINTENANCE

To return equipment to service:

- 1. Go to the **Maintenance** page.
- 2. Locate the equipment item.
- 3. Click the **Done** button in the Action column.

The equipment will be removed from the Maintenance list and restored to the Equipment list, making it available for booking.



5.5. AUDIT LOGS

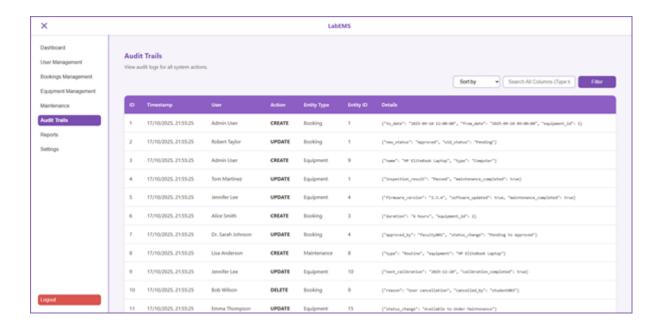
Audit logs allow administrators to monitor and track system activities performed by users and other administrators.

5.5.1. VIEWING AUDIT LOGS

To access and review audit records:

- 1. Navigate to the **Audit Log** page.
- 2. View a timestamped list of key system events, including:
 - Account creation and updates
 - Equipment additions, modifications, and deletions
 - Booking submissions, changes, and cancellations
 - Login attempts and session activity
- 3. Use available filters to search by user, equipment item, or date range for more targeted insights.

Audit logs support accountability, security monitoring, and operational transparency across the system.



5.6. REPORTS

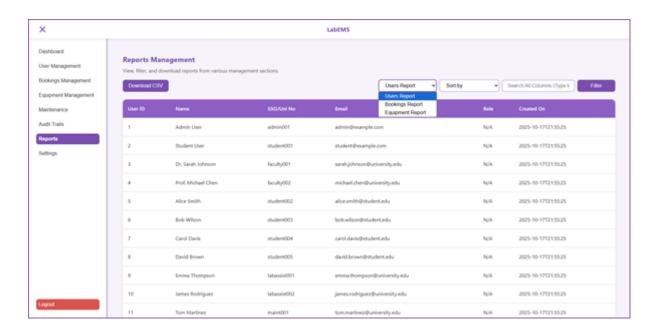
Administrators can generate detailed reports related to users, equipment, and bookings to support data analysis and operational oversight.

5.6.1. GENERATING REPORTS

To create a report:

- 1. Navigate to the **Reports** page.
- 2. Select the desired report type: Users, Equipment, or Bookings.
- 3. Apply available filters and sorting options to customize the report content.
- 4. Click **Download CSV** to export the report as a Comma-Separated Values (CSV) file.

The exported CSV file can be opened using spreadsheet applications such as Microsoft Excel or any compatible text editor.



6. TROUBLESHOOTING & FAQ

Question	Answers
Q: I cannot log in.	 A: Check your credentials and access. Ensure the email and password are typed correctly. Verify that you are registered and authorised to use this web application. If you have forgotten your password, look for a "Forgot Password" link on the login page.
Q: The UI shows outdated data.	A: Refresh the view.Try a simple page refresh to pull the latest data.
Q: I didn't receive a confirmation email for my booking or cancellation.	 A: Verify profile and check spam. Navigate to the Profile page and verify that the email address provided is correct. Check your Spam/Junk mail folder. If you still don't see it, assume the booking was not successful and verify its status on the Bookings page.
Q: My booking was rejected.	 A: The booking was likely rejected due to conflicting time slot. Choose an open time slot. Use the Equipment page details to identify and try a different time slot or date.
Q: I cannot find the "Book" button for a specific equipment item.	 A: The equipment is likely unavailable. Check the Equipment page to ensure the equipment is available for booking (e.g., status is not "In Maintenance" or "Out of Service"). The system only shows the "Book" button in the Action column when the equipment can be reserved.