Instrument Reservation System | Topic & Mission Objectives (Planning Stage)

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Topic Background

In university labs, scarce and expensive instruments must be allocated fairly, safely, and transparently. Administrators also need to schedule maintenance/calibration windows without clashing with student reservations. This project establishes a data platform around "reserve – check-in – use – maintenance – penalties – analytics" to support daily operations and end-of-term review.

Mission Statement

Build a reservation data platform centered on fairness, conflict prevention, transparent rules, and reusable data—serving students and administrators with consistent, explainable operational records and reports.

Mission Objectives

• Reservation & conflict prevention: record student reservations and avoid overlaps with maintenance windows.

• Attendance & compliance: capture check-in/check-out facts to assess lateness or no-shows.

• Maintenance windows: allow admins to create/publish high-priority maintenance or calibration periods.

• Quota/eligibility management: limit reservation frequency or duration by user plan (at most one active plan per user).

• Penalties with rule traceability: map events (late/no-show/late cancel) to penalties with references to the rule used.

• Waitlist: capture requests when time slots are full for later release or promotion.

• Operational analytics: derive utilization, lateness/no-show rates, and cancellation rates via queries/views.

User Views

Capabilities:
- Submit reservation requests (select equipment, time slot).
- View personal quota (remaining reservations, expiration date).
- Cancel reservations (free if >24h, penalty if within 24h).
- Check in / check out on site.
- View violation records and quota impact.

Accessible Information:
- Personal reservation history and status (completed / canceled / violation).
- Resource availability status (available, reserved, under maintenance).
- Quota details and penalty points.

2. Administrator Users

Capabilities:
- Make high-priority reservations (e.g., for classes, events).
- Schedule equipment maintenance/calibration.
- Review and manage student reservations.
- Review and modify violation/penalty records.
- Generate reports (resource utilization, violation statistics).

Accessible Information:
- All users' reservation data.
- Maintenance and calibration schedules.
- Resource usage and wear data to support maintenance planning.

3. System Automated Tasks

Capabilities:
- Check time conflicts to avoid double bookings.
- Verify quota limits before reservations.
- Enforce maintenance and calibration restrictions.
- Detect lateness or absence and record penalties.
- Automatically release resources (no-show, late cancellations).

- Automatically generate maintenance commands (driven by both cycle count and wear).

Scope Boundaries

In scope: data capture and queries for reservation–check-in–maintenance–penalties–analytics; basic rules like quotas and waitlists; clear reporting definitions.

Out of scope: payments/billing, complex authorization

Value / Advantages (vs. common course topics)

Realistic scenario with clear rules: common campus pain point; rules are well-defined and amenable to data modeling and validation.

Aligned with course goals: deliver conceptual modeling and business rules first, then constraints and queries; later extend to normalization, indexing, execution plans, and transactions.

Expandable demonstrations: supports later assignments and the final demo without changing topics.