

Labs Management System

Classes and Functionalities

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1. Person Classes

1.1 Person

Purpose: Represents any person in the system

Attributes:

- `id` : string
- `name` : string
- `email` : string
- `phone` : string

Main Functionalities:

- Store and retrieve person information
-

1.2 Instructor

Purpose: Faculty member who teaches lab sections

Attributes:

- Person attributes (inherited)
- `assignedSections` : List of lab sections

Main Functionalities:

- Request makeup lab sessions
 - View assigned lab sections
 - View schedule
-

1.3 TeachingAssistant (TA)

Purpose: Assistant who helps in lab sections

Attributes:

- Person attributes (inherited)
- `assignedSections` : List of lab sections

Main Functionalities:

- Get assigned lab sections
 - Assist in multiple lab sections
-

1.4 AcademicOfficer

Purpose: Administrative staff who manages lab scheduling

Attributes:

- Person attributes (inherited)

Main Functionalities:

- Populate basic lab data
- Create lab sections
- Assign instructors to sections
- Assign TAs to sections
- Set lab schedules

- Schedule makeup labs
-

1.5 Attendant

Purpose: Records actual lab timings for a building

Attributes:

- Person attributes (inherited)
- `assignedBuilding` : Building reference

Main Functionalities:

- Fill time sheets with actual start and end times
 - Mark leaves
 - Record makeup session timings
 - Manage time sheets for assigned building only
-

1.6 HeadOfDepartment

Purpose: Department head who generates reports

Attributes:

- Person attributes (inherited)

Main Functionalities:

- Generate complete lab schedule for entire week
 - Generate filled time sheet for all labs in a given week
 - Generate time sheet for all sessions of a particular lab (including total contact hours and leaves)
-

2. Venue Classes

2.1 Building

Purpose: Represents a building on campus

Attributes:

- `buildingId` : string

- `buildingName` : string
- `address` : string
- `attendant` : Attendant reference
- `rooms` : List of rooms

Main Functionalities:

- Store building information
 - Assign one attendant per building
 - Manage rooms in the building
-

2.2 Room

Purpose: Physical location where labs are conducted

Attributes:

- `roomId` : string
- `roomNumber` : string
- `capacity` : int
- `building` : Building reference
- `floor` : int

Main Functionalities:

- Store room information
 - Check room availability
 - Associate with parent building
-

3. Lab Classes

3.1 Lab

Purpose: Represents a laboratory course

Attributes:

- `labId` : string
- `labCode` : string (e.g., "CS101L")
- `labName` : string

- `credits` : int
- `semester` : string

Main Functionalities:

- Store lab course information
 - Provide lab details
-

3.2 LabSection

Purpose: A specific section of a lab with assigned instructor and TAs

Attributes:

- `sectionId` : string
- `lab` : Lab reference
- `sectionNumber` : string (e.g., "A", "B", "C")
- `instructor` : Single instructor
- `tas` : List of TAs (can be multiple)
- `sessions` : List of lab sessions
- `semester` : string
- `academicYear` : string

Main Functionalities:

- Assign one instructor
 - Assign multiple TAs
 - Manage lab sessions
 - Calculate total contact hours
 - Calculate total leaves
-

3.3 LabSession

Purpose: A single occurrence of a lab class

Attributes:

- `sessionId` : string
- `labSection` : LabSection reference
- `room` : Room reference
- `schedule` : Expected timings

- `timeSheet` : Actual timings
- `weekNumber` : int
- `status` : Session status (scheduled/completed/cancelled/makeup)

Main Functionalities:

- Store expected schedule
 - Store actual time sheet
 - Track session status
 - Identify if it's a makeup session
-

4. Timing Classes

4.1 Schedule

Purpose: Expected/planned timings for a lab session

Attributes:

- `scheduleId` : string
- `dayOfWeek` : Day (Monday-Sunday)
- `expectedStartTime` : Date and time
- `expectedEndTime` : Date and time
- `duration` : Hours

Main Functionalities:

- Store expected start and end times
 - Calculate expected duration
 - Populated by Academic Officer
-

4.2 TimeSheet

Purpose: Actual timings recorded by attendant

Attributes:

- `timeSheetId` : string
- `actualStartTime` : Date and time
- `actualEndTime` : Date and time

- `attendant` : Attendant who filled it
- `entryTimestamp` : When it was recorded
- `actualDuration` : Hours
- `status` : Present/Leave/Makeup

Main Functionalities:

- Record actual start and end times
 - Calculate actual duration
 - Mark as leave
 - Mark as makeup session
 - Filled by building's attendant only
-

4.3 DateTime

Purpose: Represents date and time

Attributes:

- `year` : int
- `month` : int
- `day` : int
- `hour` : int
- `minute` : int
- `second` : int

Main Functionalities:

- Store date and time information
 - Get day of week
 - Calculate time differences
 - Add/subtract days
-

5. Request Classes

5.1 MakeupRequest

Purpose: Request for scheduling a makeup lab session

Attributes:

- `requestId` : string
- `instructor` : Instructor who requested
- `originalSession` : The missed session
- `requestedDate` : Preferred date
- `requestedRoom` : Preferred room
- `reason` : Reason for makeup
- `status` : Pending/Approved/Rejected/Scheduled
- `requestDate` : When request was made
- `approvedBy` : Academic officer who approved
- `makeupSession` : Scheduled makeup session

Main Functionalities:

- Instructor submits request
 - Academic officer approves or rejects
 - Academic officer schedules makeup lab
 - Attendant records actual timings in time sheet
 - Update contact hours and leaves in reports after makeup
-

6. Report Classes

6.1 WeeklyScheduleReport

Purpose: Complete lab schedule for entire week

Attributes:

- `reportId` : string
- `weekNumber` : int
- `generatedBy` : Head of Department
- `generatedDate` : Date and time
- `sessions` : All sessions in the week

Main Functionalities:

- Show all lab sessions for a week
 - Display expected timings (schedule)
 - Organized by day and time
 - Generated by Head of Department
-

6.2 WeeklyTimeSheetReport

Purpose: Filled time sheets for all labs in a week

Attributes:

- `reportId` : string
- `weekNumber` : int
- `generatedBy` : Head of Department
- `generatedDate` : Date and time
- `timeSheets` : All filled time sheets

Main Functionalities:

- Show actual timings for all labs in a week
 - Display attendance status
 - Calculate total hours for the week
 - Generated by Head of Department
-

6.3 SemesterLabReport

Purpose: Complete report for a specific lab section for the semester

Attributes:

- `reportId` : string
- `labSection` : The lab section
- `generatedBy` : Head of Department
- `generatedDate` : Date and time
- `allSessions` : All sessions in semester
- `totalContactHours` : Total hours
- `totalLeaves` : Number of leaves

Main Functionalities:

- Show all sessions for a particular lab section
 - Display time sheets for each session
 - Calculate total contact hours (including makeup sessions)
 - Count total leaves
 - Show updated values after makeup labs
 - Generated by Head of Department
-

7. Enumerations

7.1 DayOfWeek

Values:

- MONDAY
 - TUESDAY
 - WEDNESDAY
 - THURSDAY
 - FRIDAY
 - SATURDAY
 - SUNDAY
-

7.2 SessionStatus

Values:

- SCHEDULED - Lab is scheduled
 - COMPLETED - Lab was conducted
 - CANCELLED - Lab was cancelled
 - MAKEUP - This is a makeup session
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7.3 TimeSheetStatus

Values:

- PRESENT - Lab was conducted
 - LEAVE - Lab was not conducted (leave)
 - MAKEUP - This is a makeup session
-

7.4 RequestStatus

Values:

- PENDING - Makeup request submitted, awaiting approval
 - APPROVED - Request approved by academic officer
 - REJECTED - Request rejected
 - SCHEDULED - Makeup session has been scheduled
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System Functionalities by Role

Academic Officer Functionalities

1. Populate basic lab data (labs, sections, rooms, buildings)
 2. Create lab sections
 3. Assign instructor to each section (only one)
 4. Assign TAs to sections (can be multiple)
 5. Set schedules (expected timings) for all sessions
 6. Approve/reject makeup requests
 7. Schedule makeup lab sessions
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Attendant Functionalities

1. Fill time sheets with actual start and end times
 2. Mark leaves when lab doesn't occur
 3. Record makeup session timings
 4. Manage time sheets only for labs in assigned building
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Instructor Functionalities

1. Request makeup lab from academic office
 2. Provide reason for makeup
 3. View assigned lab sections
 4. View lab schedule
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Head of Department Functionalities

1. Generate complete lab schedule for entire week
 2. Generate filled time sheet report for all labs in a given week
 3. Generate semester report for a particular lab showing:
 - All sessions
 - Time sheets for each session
 - Total contact hours
 - Total leaves
 - Updated values including makeup sessions
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Main System Workflows

Workflow 1: Initial Setup

1. Academic Officer creates labs
 2. Academic Officer creates lab sections
 3. Academic Officer assigns one instructor per section
 4. Academic Officer assigns TAs to sections (multiple allowed)
 5. Academic Officer creates schedule (expected timings) for all sessions
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Workflow 2: Regular Lab Session

1. Lab session occurs as per schedule
 2. Attendant of that building fills time sheet with actual start/end times
 3. Time sheet is stored for the session
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Workflow 3: Makeup Request and Execution

1. Instructor requests makeup lab (provides reason)
 2. Academic Officer receives request
 3. Academic Officer approves or rejects request
 4. If approved, Academic Officer schedules makeup lab (assigns date, room)
 5. Makeup lab is conducted
 6. Attendant enters actual start/end times in time sheet for that week
 7. Reports afterwards show updated contact hours and leaves
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Workflow 4: Report Generation

1. Head of Department requests report
 2. System generates one of:
 - **Weekly Schedule Report:** Shows all expected timings for the week
 - **Weekly Time Sheet Report:** Shows all actual timings for the week
 - **Semester Lab Report:** Shows all sessions, timings, total hours, and leaves for a specific lab section
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Summary

Total Classes: 20

Category	Classes	Count
Person Classes	Person, Instructor, TA, AcademicOfficer, Attendant, HeadOfDepartment	6
Venue Classes	Building, Room	2
Lab Classes	Lab, LabSection, LabSession	3
Timing Classes	Schedule, TimeSheet, DateTime	3
Request Classes	MakeupRequest	1
Report Classes	WeeklyScheduleReport, WeeklyTimeSheetReport, SemesterLabReport	3
Enumerations	DayOfWeek, SessionStatus, TimeSheetStatus, RequestStatus	4

Key Relationships

1. One-to-One:

- Building has one Attendant
- LabSection has one Instructor
- LabSession has one Schedule
- LabSession has one TimeSheet

2. One-to-Many:

- Building has many Rooms
- Lab has many LabSections
- LabSection has many LabSessions
- Instructor can teach many LabSections

3. Many-to-Many:

- TA can assist in many LabSections
- LabSection can have many TAs

Key System Requirements

1. Two Types of Timings:

- **Schedule:** Expected start/end times (set by Academic Officer)
- **TimeSheet:** Actual start/end times (filled by Attendant)

2. Building-Attendant Assignment:

- Each building has one attendant
- Attendant fills time sheets only for their building

3. Section Assignments:

- Each section has exactly one instructor
- Each section can have multiple TAs

4. Makeup Lab Process:

- Instructor requests
- Academic Officer schedules
- Attendant records actual timings
- Reports reflect updated hours and leaves

5. Three Report Types:

- Weekly complete schedule
- Weekly filled time sheets
- Semester lab report with totals

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