

AI for Scheduling and Resource Allocation

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AI for Scheduling & Resource Allocation in Higher Education

Universities face increasing complexity in managing timetables, classrooms, labs, and staff workloads.

Manual scheduling is time-consuming, error-prone, and often inefficient.

AI offers automated solutions to optimise:

- Class & lab schedules
- Staff teaching loads
- Room & resource utilisation

Goal: Improve efficiency, fairness, and strategic decision-making.

Key Benefits of AI in Scheduling & Resource Allocation

Optimisation: Generates conflict-free timetables in minutes.

Resource Efficiency: Matches classrooms, labs, and equipment to demand.

Staff Workload Management: Balances teaching assignments fairly.

Predictive Insights: Anticipates bottlenecks and resource shortages.

Decision Support: Provides actionable recommendations while keeping humans in control.

1. Timetable Generation Demo (Instant Scheduling)

Prompt: “Here are the modules, lecturers, classroom sizes, and time constraints. Generate a conflict-free weekly timetable. Avoid clashes and ensure the labs are assigned correctly.”

Provide sample data:

- **Lecturers:** Dr. Khan (Mon–Wed), Dr. Gooda Sahib (Tue–Fri)
- **Rooms:** Lab A (30 seats), Room 1.14 (60 seats), 1.16 (120 seats)
- **Modules:**
 - CS101 (needs lab)
 - MGT201 (lecture only)
 - AI300 (needs 2 sessions)

2. AI for Staff Load Allocation (Teaching Workload)

“Allocate teaching workloads for the following lecturers so that nobody exceeds 12 credits and all modules are covered. Suggest an optimal distribution.”

Provide simple data:

- Dr. Pillay – Data Mining, available Tue–Thu
- Dr. Ali – Programming, available Mon–Wed
- Dr. Kim – AI, available Mon–Fri
- Modules: Data Mining (3h), AI (3h), Python (4h), Web Dev (2h), DB Systems (3h)

AI will generate: A workload table, A justification (“skills match”, “module expertise”) and Alternative assignments

3. AI for Room & Lab Allocation (Resource Optimisation)

Provide data like:

- Lab A: 30 seats (Computing)
- Lab B: 25 seats (Multimedia)
- Room 101: 60 seats
- Need to schedule sessions for 4 courses with enrolments: 70, 22, 28, 15

Give prompt:

“Assign rooms to each course based on capacity and room type. Avoid clashes and maximise space utilisation. Then identify potential bottlenecks.”

AI produces:

- Room assignments, Alternative options, Notes on over/underutilisation and Warnings (e.g., “70 students cannot fit in Room 101”)

AI Scheduler for Meetings

“Schedule a 1-hour meeting next week with all available managers:

- Dr. Khan (Mon AM, Wed PM)
- Ms. Devi (Tue PM, Thu AM)
- Mr. Lee (Mon PM, Wed AM)
Avoid afternoons.”

AI finds the earliest feasible slot instantly.

AI Assisted Invigilation Scheduling (Part 1)

Context:

The university is preparing for the end-of-semester exams. There are multiple courses, hundreds of students, and dozens of available invigilators. The goal is to create a **conflict-free, fair invigilation schedule** that ensures:

- Every exam has the required number of invigilators
- No invigilator is double-booked
- Workload is balanced among staff
- Room and time constraints are respected

AI Assisted Invigilation Scheduling (Part 2)

- **Courses & Exams:**

- CS101 – 120 students – 3 hours – Room A & B
- MGT201 – 60 students – 2 hours – Room C
- AI300 – 80 students – 3 hours – Room A & D
- ENG102 – 50 students – 2 hours – Room B & C

- **Available Invigilators:**

- Dr. Khan , Ms Devi, Mr Lee, Dr Pillay and Ms Sharma

- **Constraints:**

- Each exam needs **2 invigilators per room**
- Each invigilator should have 1 exam session per day
- Rooms cannot host more than one exam at the same time

AI Assisted Invigilation Scheduling (Part 3)

Prompt for AI

“Generate a conflict-free invigilation schedule for the exams listed below. Ensure:

- All rooms are covered with required invigilators
- No invigilator is double-booked
- Workload is balanced
- Output a table showing: Exam, Room, Date/Time, Chief Invigilator, Invigilator”

AI for Budget Allocation

Provide simple numbers:

Faculty budget: Rs 1.2M

Needs: equipment, training, marketing, events

Constraints: equipment min Rs 400K, training min Rs 200K

Ask AI: “Generate an optimal allocation model. Suggest 3 strategies depending on whether we prioritise quality, cost savings, or student impact.”

AI-Driven Scenario Simulation (Role-Play)

Managers interact with an AI that **plays the role of**:

- an employee
- a difficult client
- a department head
- a union representative
- an angry student or parent
- an auditor
- a supplier
- a board member

The AI responds dynamically, forcing participants to:

- negotiate
- de-escalate conflicts
- make decisions
- give feedback
- guide teams
- prioritise resources

It feels like a real meeting.

AI-Driven Scenario Simulation (Role-Play)

Crisis Management

AI plays the Public Relations Officer:

“You are the PR Officer. There’s a social media complaint about delayed exam timetables. What should we do? I am the Dean”

Managers must:

- assess situation
- assign actions
- protect reputation
- communicate clearly