VADODARA HACKATHON 6.0

TITLE PAGE

- **Problem Statement ID – SIH25028**

- **Problem Statement Title- Smart Classroom & Timetable Scheduler**

- **Theme- Education / Smart Campus Solutions**

- **PS Category- Software**

- **Team ID- VH6_PIT_027**

- **Team Name - Impact Innovators 2.0**

IDEA TITLE

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Smart Classroom & Timetable Scheduler

Proposed Solution:

- A web based intelligent scheduling system for colleges.
- Generates optimized timetables considering classrooms, faculty availability, subjects, and student batches.
- Prevents conflicts by auto-locking classrooms and teachers once assigned (like booking movie tickets).
- Provides multiple timetable options with rearrangement suggestions.
- Supports multi-department, multi-shift scheduling.

Innovation & Uniqueness:

- Interactive movie-ticket booking style UI for easy scheduling.
- AI/algorithm-based optimization (constraint solving, genetic algorithms).
- Real-time adaptability for sudden faculty leaves or class changes.
- o-locking classrooms and teachers once assigned (like booking movie tickets).
- Provides multiple timetable options with rearrangement suggestions.
- Supports multi-department, multi-shift scheduling.

TECHNICAL APPROACH

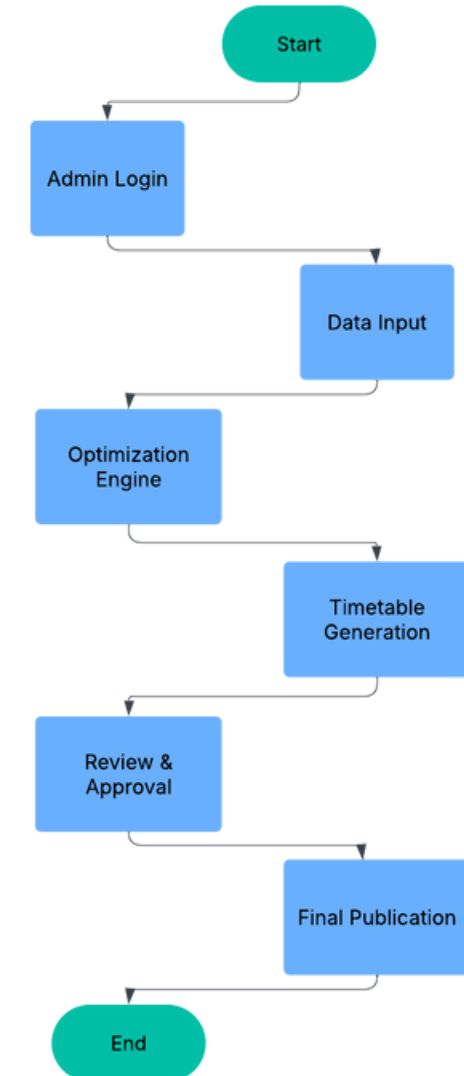Parul® University
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Technologies to be used:

- Frontend: React.js / Angular (interactive UI with drag-and-drop, tabs for classrooms).
- Backend: Node.js / Django / Flask
- Database: PostgreSQL / MySQL
- Optimization: Google OR-Tools / Linear Programming / Genetic Algorithms
- Real-Time Updates: WebSockets / Firebase

Methodology & Process:

- Input variables (classrooms, faculty, subjects, slots, constraints).
- Optimization engine generates multiple schedules.
- Admin reviews and finalizes.
- Timetable auto-published & notifications sent.

Flow Diagram:

Start → Admin Login → Data Input → Optimization Engine → Timetable Generation → Review & Approval → Final Publication → End

FEASIBILITY AND VIABILITY

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Feasibility:

- Built using readily available open-source frameworks -> low development cost.
- Supports web + mobile interfaces for better accessibility.
- Modular design allows integration with existing ERP/attendance systems.
- Cloud-based deployment ensures 24/7 availability and remote access.

Challenges & Risks:

- Complexity in handling elective subject overlaps.
- Scaling performance with thousands of students & multi-shift scheduling.
- Ensuring data security & privacy (faculty/student info).
- Change management -> shifting from traditional spreadsheets to automated system.

Strategies to Overcome Challenges:

- Use advanced algorithms (constraint programming + ML predictions).
- Implement role-based access control for security.
- Provide offline export options (PDF/Excel) to maintain familiarity.
- Continuous feedback loop from faculty/admin to refine usability.
- Pilot rollout in one department -> scale gradually across institution.

IMPACT AND BENEFITS

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Impact:

- Removes manual scheduling headaches for colleges.
- Helps faculty manage workload fairly.
- Ensures smooth learning experience for students.
- **Students:** Clear, clash-free schedules → improved academic experience.
- **Faculty:** Balanced teaching load -> reduced stress, higher satisfaction.
- **Administration:** Automated approvals -> less manual intervention, fewer errors.
- **Institution:** Better utilization of infrastructure -> improved efficiency.

Benefits:

- **Social:** Transparent system reduces complaints & scheduling disputes.
- **Academic:** Enables flexible curriculum under NEP 2020 (cross-department electives).
- **Economic:** Saves man-hours spent on manual timetable creation every semester.
- **Operational:** Dynamic rescheduling during emergencies (faculty leave, classroom outage).
- **Environmental:** Reduces paper-based timetables -> supports green campus initiative.
- **Scalability:** Can be extended to hostel management, exam scheduling, event planning.

RESEARCH AND REFERENCES

Reference:

- NEP 2020 Guidelines on flexible curriculum.
- Google OR-Tools (Constraint Programming for scheduling).
- Existing timetable management systems (limitations study).
- Research papers on genetic algorithm-based timetabling.