

# PRESIDENCY UNIVERSITY

## EXAMINATION TIMETABLE GENERATION

Batch Number: CSE-G09

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# Introduction

## ➤ Purpose of Timetable Generation:

Generating timetables ensures efficient management of educational institutions, influencing academic experiences.

## ➤ Challenges in Manual Timetable Creation:

Manual scheduling is complex and time-consuming, prone to errors and inefficiencies, especially in large universities.

## ➤ Need for Automation:

Increasing student enrollment and institutional growth highlight the need for automated solutions.

## ➤ Objective of the Project:

Develop an Automatic Timetable Generation System to ensure conflict-free, optimized scheduling using modern technologies.



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➤ **Specific Focus on Exam Scheduling:**

The project emphasizes automating exam timetables, including room assignments and invigilator scheduling, using technologies like Spring Boot, Java, HTML, CSS, and MySQL.

➤ **Benefits of Automation:**

- Reduces errors and manual effort.
- Enhances scalability and adaptability.
- Optimizes resource utilization (rooms, faculty).
- Improves flexibility for dynamic updates and rescheduling.



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# Literature Review

The literature review contrasts traditional manual scheduling methods with automated systems.

- **Manual Techniques:** Time-consuming, prone to errors, and limited scalability.
- **Automated Systems:** Employ algorithms such as **Genetic Algorithms**, **Greedy Algorithms**, and **Constraint Satisfaction Problem (CSP)** solvers to improve accuracy and reduce conflicts.
- Examples of reviewed works include scheduling systems using **Genetic Algorithms** and **Integer Programming** with noted challenges in scalability and complexity handling.



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# Research Gaps Identified

Identified limitations in existing systems include:

- 1.Lack of flexibility** for institutional-specific requirements.
- 2.Inadequate conflict resolution mechanisms** for complex constraints.
- 3.Scalability issues** when handling large datasets.
- 4.Limited integration** with modern technologies (e.g., Learning Management Systems).
- 5.Suboptimal resource utilization** due to inefficient allocation.
- 6.Rigid algorithms** unable to adapt to evolving requirements.
- 7.Insufficient user-friendly interfaces** for non-technical users.



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# Proposed Methodology

The project methodology involves six key phases:

- 1.Requirement Gathering & Analysis**
- 2.Data Modelling & Database Design**
- 3.Backend Development** using Spring Boot for business logic.
- 4.Frontend Development** with a user-friendly interface built using Thymeleaf and JavaScript.
- 5.Testing & Validation** through unit, integration, and user acceptance testing.
- 6.Deployment & Maintenance** on a cloud platform for scalability.



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# Objectives

- ✓ **Automate timetable generation** to reduce manual effort.
- ✓ Ensure **conflict-free scheduling** of exams, rooms, and invigilators.
- ✓ **Optimize resource utilization**, balancing workloads for faculty and minimizing idle resources.  
Provide **customization options** to handle unique institutional requirements.
- ✓ Design for **scalability and performance** to handle large datasets.
- ✓ Deliver a **user-friendly experience** with intuitive interfaces and real-time feedback.  
Ensure **security and confidentiality** of exam-related data.



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# System Design & Implementation

The system consists of three main layers:

- 1. Frontend:** HTML, CSS, JavaScript with Thymeleaf for rendering dynamic content.
- 2. Backend:** Spring Boot framework with RESTful APIs to handle business logic.
- 3. Database:** MySQL relational database for storing information about courses, rooms, and timetables. Key components include controllers, services, and repositories. The system flow involves:
  - Data input by administrators (courses, rooms, faculty).
  - Timetable generation using a combination of algorithms.
  - Conflict resolution and real-time updates.



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# Timeline of Project

- **Phase 1:** Requirement Gathering – **1 week**
- **Phase 2:** Data Modelling & Database Design – **2 weeks**
- **Phase 3:** Backend Development – **4 weeks**
- **Phase 4:** Frontend Development – **3 weeks**
- **Phase 5:** Testing & Validation – **2 weeks**
- **Phase 6:** Deployment & Maintenance – **1 week**

Total Duration: **13 weeks**



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# Outcomes / Results Obtained

- **Timetable creation:** The system successfully generates conflict-free exam schedules considering constraints like room capacity, faculty availability, and student registrations.
- **Resource allocation:** Efficiently assigns rooms and invigilators.
- **User engagement:** Provides an intuitive interface for users to interact with the system and make manual adjustments if needed.
- **Reduced manual effort:** Automates most of the timetable generation process, significantly reducing administrative workload.



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# Conclusion

- The Examination Timetable Generation system effectively automates the scheduling process, ensuring conflict-free, scalable, and efficient timetables for educational institutions.
- Key achievements include optimal resource allocation, reduced errors, and improved user experience. Future enhancements could involve AI-based optimization and integration with existing university systems.



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