

JAVA MINI PROJECT

STUDENT PERFORMANCE ANALYSIS AND RESULT MANAGEMENT SYSTEM

Problem Statement:

In many colleges, student marks, attendance, and results are maintained manually using notebooks and multiple Excel sheets. Faculty members enter marks, calculate totals and percentages, assign grades, and check attendance eligibility manually for each student. This process is time-consuming, especially when handling large numbers of students and subjects.

Manual calculations often lead to human errors such as incorrect mark addition, wrong grade assignment, and attendance miscalculations. Maintaining separate records for marks, attendance, and results creates confusion and makes it difficult to track student backlogs and academic progress accurately. Attendance is usually calculated at the end of the semester, leaving students unaware of shortages until it is too late.

Additionally, the existing system does not provide proper performance analysis, such as identifying weak subjects or overall academic trends. Due to these limitations, the current manual system lacks efficiency, accuracy, and transparency, highlighting the need for an automated solution.

Proposed Solution:

Our project provides an automated solution using Java, where all student records are processed electronically. The system is designed in accordance with academic regulations, including attendance eligibility and pass criteria, and automatically calculates attendance, percentages, results, and backlogs within seconds, ensuring accuracy, efficiency, and reliability.

Real-Life Example

Without Our System (Manual Method)

A teacher handles a Java subject with **60 students**.

Each student has:

- 1) Internal marks (out of 30)
- 2) External marks (out of 70)

For every student, the teacher:

- 1) Manually adds marks (for example: $28 + 65 = 93$)

- 2) Checks whether the total is **greater than or equal to 40** to decide pass or fail
- 3) Assigns a grade (A, B, C, D, or F)
- 4) Separately checks attendance registers
- 5) Maintains **multiple Excel files** for marks, attendance, and results

This process is repeated **60 times** for all students.

- 1) **Time required:** 2–3 hours
- 2) **Problems:** Calculation errors, attendance mistakes, confusion due to multiple Excel files, and no clear performance analysis

With Our System (Automated Method)

The teacher enters marks and attendance into the system only once.

The **Java-based system automatically:**

- 1) Calculates total marks
- 2) Determines pass or fail
- 3) Assigns grades
- 4) Analyzes student performance (subject-wise and semester-wise)
- 5) Monitors attendance percentage
- 6) Generates alerts for low attendance
- 7) Stores all data in a **single centralized database**, eliminating the need for multiple Excel files
- 8) **Time required:** Less than 5 minutes
- 9) **Errors:** Zero (fully automated and accurate)
- 10) **Extra Benefits:** Easy data management, clear performance insights, and instant attendance alerts

WHY DID WE BUILD THIS? (Problem)

Problems in Current System:

Problem 1: Too Much Manual Work

- 1) Faculty spend hours calculating results
- 2) Use calculator to add marks
- 3) Write results on paper
- 4) Very tiring and boring work

Problem 2: Mistakes Happen

- 1) Wrong addition: $45 + 32 = 76$ (instead of 77)
- 2) Wrong grade given
- 3) Student fails/passes wrongly
- 4) Can ruin student's career

Problem 3: Backlog Confusion A "backlog" means a student failed a subject and must repeat it.

Current Problem:

- 1) College has 500 students
- 2) Some failed in Year 1, some in Year 2
- 3) Which student has backlog in which subject?
- 4) Very difficult to track manually
- 5) Students themselves don't know which subjects to clear

Problem 4: Attendance Issues

- 1) Attendance written in register
- 2) Difficult to calculate percentage quickly
- 3) Students don't know if they have shortage until too late

Problem 5: No Analysis

- 1) Which subject do students fail most?
- 2) Which topics are difficult?
- 3) No way to know without analysis

Feature 1: Automatic Result Calculation using QR Code and OMR Sheet Scanning

In the traditional system, teachers manually calculate marks and prepare results for every student, which is time-consuming and prone to errors. Our system automates this entire process by integrating **QR code-based student identification with OMR sheet scanning**. Each student is assigned a **unique QR code mapped to their roll number**. During the examination, this QR code is printed on the OMR answer sheet. When the OMR sheet is scanned, the system first reads the QR code to automatically identify the student's roll number and academic details, eliminating manual entry.

After identifying the student, the system evaluates the marked answers using predefined answer keys and calculates the subject-wise marks automatically. The Java-based backend then processes this data by calculating total marks, checking pass or fail conditions according to university regulations, and assigning grades based on predefined grading rules.

Finally, the complete result—including roll number, student name, subject name, total marks, grade, and pass/fail status—is stored securely in the database and displayed instantly. This automated approach significantly reduces faculty workload, eliminates calculation errors, and ensures fast, accurate, and reliable result generation.

Feature 2: Smart Backlog Detection

- One of the most powerful features of our project is **automatic backlog detection**. A backlog occurs when a student is unable to clear a subject due to insufficient marks or poor attendance.
- Our system handles **two types of backlogs**.
The first is a **marks backlog**, which occurs when the student scores less than the required pass marks. The second is an **attendance backlog**, which occurs when the student's attendance percentage is below the minimum required level (75%).
- After calculating marks and attendance, the system automatically checks all academic rules. If a student fails to meet any condition, the system immediately marks that subject as a backlog. Along with this, the system stores complete backlog information such as the student's name, subject name, subject code, year of study, semester, reason for backlog, and the date.
- For example, if a student named **Priya Sharma**, studying in **Second Year, Semester 1**, fails in **Database Management** due to scoring only 35 marks, the system records this as a marks backlog. If the same student has only **68% attendance** in **Operating Systems**, the system marks it as an attendance backlog. The system then clearly shows that the student has **two backlogs** and cannot proceed until they are cleared.
- This feature is extremely useful because students clearly understand **which subject they failed and why**, colleges can plan supplementary exams easily, parents get transparency, and university records remain accurate and reliable.

Feature 3: Attendance Tracking and Alerts

- Attendance management is another important part of the system. Faculty members mark attendance daily through the system, and each class attendance is stored automatically.
- Once the semester progresses, the system calculates the attendance percentage for each student by comparing the total classes conducted and the total classes attended. For instance, if Rahul has an attendance of **85%**, he is marked as eligible. If Priya has only **70%**, the system identifies this as attendance shortage.
- Whenever a student's attendance falls below the required percentage, the system generates an alert showing the student's name, current attendance, required attendance, and the action to be taken. This early alert system helps students improve their attendance before it becomes a backlog.

Feature 4: Performance Analysis

- The system also provides detailed performance analysis at both subject and student levels.
- In **subject-wise analysis**, the system calculates the total number of students, number of passes and failures, pass percentage, and class average. If the pass percentage for any subject is low, the system highlights it so that faculty can take corrective measures such as revision classes or extra sessions.
- In **student-wise analysis**, the system displays subject-wise marks, grades, pass or fail status, overall percentage, and weak subjects. This helps students understand their academic strengths and weaknesses clearly and work on improvement areas.

Database Structure

The database is designed to store all academic data in a **structured and centralized manner**. Each table has a specific purpose, and all tables are connected using keys to maintain data consistency and accuracy.

Students Table

Purpose:

This table stores the basic details of each student and is the **master table** of the system.

Information Stored:

- Roll number (unique for each student)
- Student name
- Academic year and semester
- Section details
- QR code value mapped to the roll number

Importance:

The roll number acts as the **primary key** and is used to link student information with attendance, exam data, results, and backlogs. The QR code field enables automatic student identification during OMR sheet scanning.

Subjects Table

Purpose:

This table stores subject-related information offered by the college.

Information Stored:

- Subject code (unique)
- Subject name
- Year and semester
- Maximum marks
- Minimum pass marks

Importance:

This table defines academic rules such as pass marks and is used during result calculation and backlog detection.

Attendance Table**Purpose:**

This table maintains subject-wise attendance details for each student.

Key Information Stored:

- Roll number
- Subject code
- Classes attended
- Total classes conducted
- Attendance percentage

Importance:

Attendance percentage is calculated and used to determine attendance eligibility and attendance-based backlogs according to university regulations.

OMR Exam Data Table**Purpose:**

This table stores the input data received from the OMR evaluation process.

Key Information Stored:

- Exam ID
- Roll number (identified using QR code)
- Subject code
- Marks obtained
- Exam date

Importance:

This table represents automated exam evaluation data and serves as the input for result processing. It eliminates manual mark entry.

Results Table**Purpose:**

This table stores the final processed results for each student and subject.

Information Stored:

- Result ID
- Roll number
- Subject code

- Total marks
- Grade
- Pass or fail status

Importance:

This table is generated after processing marks and attendance and is used to display results to students and faculty.

Backlogs Table

Purpose:

This table stores details of subjects in which a student has failed.

Information Stored:

- Roll number
- Subject code
- Type of backlog (marks or attendance)
- Reason for backlog

Importance:

This table helps in tracking failed subjects clearly and supports academic planning such as supplementary exams.

How the System Works (Technical Flow)

- Initially, the admin adds student and subject details into the system. Faculty members then enter daily attendance and internal as well as external marks. All this data is stored in a **single centralized database**, eliminating the need for multiple Excel files.
- The Java backend processes this data by calculating totals, deciding pass or fail status, assigning grades, detecting backlogs, analyzing performance, and generating reports. Finally, results and reports are displayed to users based on their roles.
- Students can log in to view their results, attendance, and backlog details. Faculty members can view class performance and generate reports, while admins can access complete academic statistics.

Users of the System

- The system is used by three main roles.
The **Admin** manages students, subjects, and overall system control.
The **Faculty** marks attendance, enters marks, and views subject performance.
The **Students** view results, attendance status, backlog details, and download reports.

Technologies Used

- **Java** is the core technology used in this project. It handles all calculations, business rules, result processing, grade assignment, attendance evaluation, backlog detection, performance analysis, and communication with the database.
In addition to backend processing, **Java is also used to provide a Java-based user interface (Swing)** for interacting with the system without using any web technologies.
- The **database (MySQL / Oracle)** is used to store all academic data securely, including student details, marks, attendance, results, and backlog information. This centralized database replaces multiple Excel sheets and manual registers.
- **HTML and CSS** are used as an **alternative interface version** to design web-style forms and dashboards for better presentation. They are used only for user interaction and display purposes and do not perform any calculations or business logic. All processing is handled by Java.

Team Collaboration

- This project was developed by a team of seven members, where each member was responsible for a specific module such as student management, subject management, attendance, result processing, backlog management, performance analysis, and UI with testing. The project was developed using Eclipse IDE, and GitHub was used for version control and to integrate all modules, enabling effective collaboration among team members working from different systems.