



AUTOMATED CLASS SCHEDULING SYSTEM FOR AEMILIANUM COLLEGE INC.

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Abstract

During the development, testing, and evaluation of the Automated Class Scheduling System, several key findings were established. The system effectively managed faculty loadings, class programs, faculty schedules, and room utilization, streamlining the scheduling process and ensuring optimal resource allocation. The Admin Module played a crucial role in managing user roles, class scheduling configurations, and system settings, allowing administrators to oversee user management, maintain departmental schedules, and customize scheduling criteria to meet the institution's needs. Additionally, the integration of report generation within the system successfully provided comprehensive summaries of teaching loads, class programs, faculty schedules, and room utilization, thereby facilitating data-driven decision-making and efficient resource management. The system was evaluated against the ISO 25010 industry standards and was found to meet the expected levels in functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. It achieved a 3.17 overall mean from the evaluators, indicating that it met expectations across all quality attributes.

Based on these findings, several conclusions were formulated. The Automated Class Scheduling System was successful in managing faculty loadings, class programs, faculty schedules, and room utilization, optimizing the scheduling process and resource allocation. The Admin Module was effective in handling user management, class scheduling

configurations, and system settings, ensuring that administrators could easily maintain schedules and customize the system to fit institutional requirements. The report generation feature proved to be an essential tool for providing insights into teaching loads, faculty schedules, and room utilization, aiding in data-driven decision-making and resource management. Furthermore, the system met ISO 25010 industry standards in terms of various quality attributes, with an overall mean of 3.17, which reflected that it met evaluators' expectations across all areas.

From the conclusions, several recommendations were made. The Automated Class Scheduling System effectively streamlined the management of faculty loadings, class programs, faculty schedules, and room utilization, ensuring efficient resource allocation. The Admin Module provided administrators with an effective tool for managing user roles, class scheduling, and system settings, allowing the system to align with institutional requirements. The report generation feature continued to provide valuable insights that supported effective decision-making. The system's successful adherence to ISO 25010 standards across various quality attributes, with a 3.17 overall mean, demonstrated that it met evaluators' expectations. Additionally, the seamless integration of all features and functionalities in the system highlighted its overall effectiveness in improving the class scheduling process and enhancing operational efficiency.

Keywords. *Aemilianum College, Inc., Academic Timetabling, Algorithmic Scheduling, Automated Scheduling, Class Timetabling, College*

Scheduling System, Faculty Scheduling, Schedule Optimization

Introduction

One of the remarkable and much-known products of technological advancement is the conversion of manual systems into automated systems. Automation produces a great impact in our lives, particularly in the fields of industry, business, medicine, and education. Most schools around the world remained in the practice of traditional scheduling for most parts of the 20th century. Teaching load and student scheduling are critical components in the academic environment (Smith, 2020).

In the Philippines, educational institutions have increasingly recognized the importance of adopting automated systems to address the challenges associated with traditional manual scheduling. Many schools and universities across the country are now exploring technology-driven solutions to streamline administrative processes, improve efficiency, and reduce the risk of scheduling conflicts. Given the growing number of students and faculty members, as well as the complexity of course offerings, manual scheduling methods are often insufficient to accommodate these needs effectively (Dela Cruz, 2021). The shift to automated scheduling systems is especially critical in managing academic loads, classroom availability, and timetabling adjustments, ensuring that educational resources are optimally utilized. This transition aligns with the broader goal of enhancing the quality of education in the Philippines, as streamlined scheduling fosters a more conducive learning environment for students and supports educators in managing their teaching responsibilities (Garcia, 2022).

In the Bicol Region, particularly in Sorsogon Province, educational institutions have also begun embracing technology to address the unique challenges faced by local schools and colleges. Many institutions in this region are still reliant on traditional scheduling methods, which often lead to time-consuming processes and inefficiencies, especially in larger institutions with diverse course offerings and faculty members (Reyes, 2023). The need for automated systems has become more apparent as these schools aim to enhance their administrative functions and reduce errors in scheduling. With increased awareness of the benefits of automation, colleges in Sorsogon, like Aemilianum College Inc., are exploring innovative scheduling solutions to optimize faculty and classroom assignments. This shift not only supports institutional efficiency but also contributes to the overall educational advancement in the region, aligning with the broader vision of regional development through technological integration in educational management (Villanueva, 2024).

The Aemilianum College Inc. (ACI) as an educational institution has offered courses in technology, education, and engineering. It provided information for every course a traditional manual method for creating class schedules involve significant effort, time and are prone to various issues. Given the challenges of traditional scheduling methods and the growing complexity of academic scheduling needs, there is a clear need to conduct this study and develop an automated class scheduling system specifically for Aemilianum College Inc. Implementing an automated scheduling

system will allow the college to enhance the accuracy and efficiency of its scheduling processes, reducing the potential for human error and minimizing the time spent on creating and managing schedules. This system will also improve the allocation of classrooms and resources, ensuring that both faculty and students have a seamless experience, with fewer scheduling conflicts and better-managed class loads.

An automated scheduling system will provide real-time updates and adjustments,

adapting to last-minute changes, faculty availability, and room allocations - capabilities that a manual system cannot easily provide. This innovation supports the college's vision for modernized administrative practices, aligning with the broader technological advancements in educational management across the region. The system's benefits extend beyond convenience; it is a strategic tool to improve institutional productivity, support faculty and administrative staff, and ultimately contribute to a more organized and productive learning environment at Aemilianum College Inc.

Specific Objectives

Specifically, the study aimed to:

1. Develop an Automated Class Scheduling System that manages:
 - 1.1. Faculty loadings,
 - 1.2. class program,
 - 1.3. faculty program, and
 - 1.4. room utilization.
2. Design an Admin Module:
 - 2.1. User Management
 - 2.2. Scheduling Management
 - a. Configure and Manage Class Schedules: maintain schedules for various departments and courses
 - 2.3. System Settings
 - a. Configure Scheduling System Settings: customize scheduling
3. Integrate Report Generation:
 - 3.1. Summary of Teaching Loads
 - 3.2. Class Program
 - 3.3. Faculty Program
 - 3.4. Room Utilization
4. Evaluate the developed system using the ISO 25010 industry standard in terms of:
 - 7.1. Functional Suitability
 - 7.2. Performance Efficiency
 - 7.3. Compatibility
 - 7.4. Usability
 - 7.5. Reliability
 - 7.6. Security
 - 7.7. Maintainability
 - 7.8. Portability

Scope and Delimitations

The scope of this study encompasses the development of an Automated Class Scheduling System for Aemilianum College Inc., focusing on the efficient management of faculty loadings, class programs, faculty programs, and room utilization. The system includes an Admin Module to support User Management and Scheduling Management,

allowing administrators to configure and maintain class schedules across various departments. Additionally, System Settings enable administrators to customize scheduling criteria, constraints, and preferences to fit the college's needs. A critical component of this system is Report Generation, which provides essential insights

through reports on teaching load summaries, class programs, faculty programs, and room utilization, helping administrators make data-driven decisions. To ensure the quality and functionality of the system, it will be evaluated based on the ISO 25010 industry standard, covering Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability. The evaluation process will involve 10 IT professionals and 2 end-users from Aemilianum College, whose feedback will inform system refinement.

The study is limited to the design, development, and assessment of an automated scheduling system specific to

Gap Bridged by the Study

In previous studies, multiple approaches were explored for developing efficient scheduling systems within educational institutions. Maharjan and Ghimire applied machine learning and neural networks to automate timetable generation, addressing complex scheduling constraints. Similarly, Gemechu Taye investigated AI-driven cloud-based scheduling applications, focusing on overcoming the limitations of traditional scheduling. Usman Khan created a timetable framework optimized for medium-sized institutions using PHP and MySQL, while Lalitha et al. used heuristic algorithms to develop a user-friendly scheduling solution tailored for administrators and faculty members. Other studies like Ortega et al. emphasized decision support frameworks to optimize faculty resource utilization and resolve scheduling conflicts effectively.

Plan

Aemilianum College Inc., focusing only on regular class schedules, faculty assignments, and classroom allocations. The system is intended solely for internal use and does not include scheduling for extracurricular or special events, nor does it integrate with external or third-party institutional management systems such as enrolment, payroll, or other administrative platforms. Furthermore, access to the system will be restricted to administrative staff for configuration and management, with faculty and students having limited access only to view their schedules. Advanced AI-driven scheduling and integration with broader institutional systems are beyond the scope of this study, as the focus remains on meeting the scheduling requirements of Aemilianum College Inc.

The present study distinguished itself by integrating AI techniques, particularly machine learning and neural networks, to achieve highly automated and adaptive scheduling. Unlike prior systems, which often relied on heuristic or genetic algorithms, this system focused on dynamically generating schedules that satisfied complex constraints and efficiently allocated institutional resources. This approach not only ensured precision in schedule generation but also enhanced responsiveness to real-time changes and conflict resolution. By bridging the gap left by traditional scheduling methods, this study offered a robust, AI-driven framework that significantly advanced the efficiency and flexibility of academic scheduling systems.

In the study titled “*Automated Class Scheduling System for Aemilianum College Inc.*”, the researcher conducted a detailed investigation to evaluate the feasibility and practicality of implementing an automated scheduling system. Data essential for computerizing the scheduling process was gathered through a combination of interviews with key stakeholders, including the Dean, administrators, and faculty members, to gain a deeper understanding of the institution’s scheduling needs. Additionally, existing scheduling records, rules, and policies were reviewed to ensure that the system would

Requirements

In this phase focuses on collecting, analyzing, and documenting the specific needs and constraints for the Automated Class Scheduling System. This phase ensures that the system’s design and development align with the expectations of stakeholders and comply with institutional policies. Its objectives include identifying and documenting the needs of all stakeholders (administrators, faculty, and students), defining the rules, constraints, and parameters the system must adhere to, and ensuring the proposed solution addresses existing challenges while remaining compliant with institutional guidelines.

Design

The modular design approach for the Automated Class Scheduling System ensures that the system is divided into distinct components, making development, testing, and maintenance more manageable. Each module addresses specific functionalities critical to the system's success. The User Management Module handles user roles and permissions, allowing admins, faculty, and students to access system features based on their designated roles. The Scheduling Engine is at the core of the system,

adhere to institutional guidelines. These documents provided valuable information to define the constraints and parameters for system development.

The development process began with a comprehensive assessment of the institution's scheduling requirements. This initial phase aimed to understand the current processes, identify challenges, and gather essential requirements to align the proposed system with institutional goals and constraints.

The Requirements Specification Phase entails defining functional requirements - such as automated schedule generation and conflict resolution - and identifying non-functional requirements, including system reliability, usability, and scalability. Key rules to be followed include preventing scheduling conflicts for both faculty and students and ensuring classroom capacities are not exceeded. Additionally, the system prioritizes preferences, such as accommodating faculty’s preferred teaching times and minimizing schedule gaps for students, to optimize the scheduling process.

automating the schedule creation process while adhering to institutional policies and constraints. The Database Management Module securely stores essential data, such as course details, faculty availability, room capacities, and generated schedules. Additionally, the Reporting Module provides users with detailed insights through reports on schedules, faculty workloads, and room utilization. The system utilizes a robust technology stack, including ModusToolbox for programming, MySQL for database

management, and Visual Studio Code as the primary development environment, ensuring a seamless and efficient development process.

The Dashboard Window serves as the central hub for users, offering a streamlined and intuitive interface to manage scheduling tasks. Designed with user-friendliness in mind, the dashboard provides Rooms,

faculty, and students with easy access to important system features and data. It consolidates key metrics, notifications, and tools, allowing users to oversee class scheduling activities, monitor faculty assignments, and allocate rooms effectively. With its organized layout, the dashboard enhances user efficiency by enabling quick navigation and interaction, ensuring that all stakeholders can manage their responsibilities with ease and confidence.

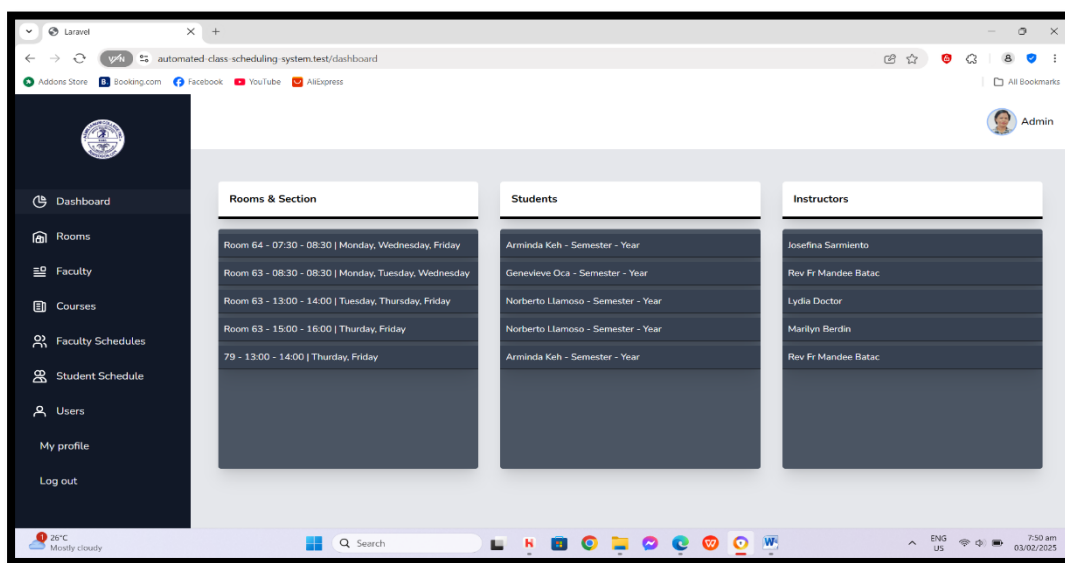


Figure 4.1 Dashboard Window

Figure 4.1 depicts the dashboard, which serves as the primary interface for managing the Automated Class Scheduling System. The Administrator first creates users, including faculty and students, as well as room assignments for laboratory or lecture rooms. Faculty and student schedules are also

generated. The dashboard presents a visually organized table and an intuitive layout, customized for each user role—whether faculty or student. It includes sections displaying student schedules, faculty names, assigned rooms, and corresponding time slots and days.

Development

An automated class scheduling system is developed to enhance and simplify the scheduling process for Aemilianum College Inc. This system ensures efficient class scheduling by addressing multiple constraints, such as instructor timetables,

course requirements, and student enrollment, and room availability.

Database Design develops a robust database to store essential data such as faculty profile, student profiles, course, and

classroom details. It creates user-friendly interfaces for different users, such as administrators who manage courses, instructors, and rooms. Instructors' views and update their schedules. Students enroll in classes and check their schedules.

To generate optimal class schedules while minimizing conflicts, advanced scheduling algorithms such as genetic algorithms, simulated annealing, or constraint satisfaction methods can be

Testing

In the study titled *Automated Class Scheduling System for Aemilianum College Inc.*, the Testing and Evaluation phase plays a critical role in ensuring that the system functions as intended and meets the needs of all stakeholders. System functionality testing is performed to verify that key features, such as class scheduling, resource allocation, and conflict detection, operate seamlessly. This includes unit, integration, and system testing to check individual components, their interaction, and the overall system performance. Performance testing, such as load and stress testing, ensures the system can handle heavy usage without performance degradation. Usability testing is conducted to assess the user-friendliness of the system,

utilized. The intelligent scheduling algorithm should automate the class allocation process by balancing instructor availability with course and room requirements. It must avoid scheduling conflicts, maximize resource utilization, and prioritize student needs, such as reducing overlapping classes. Development environment using Visual Studio, Core application logic using PHP for robust backend development, and database integration using MySQL for storing and managing data.

gathering feedback from administrators, faculty, and students to identify areas for improvement. Security testing, including penetration and data encryption testing, ensures that sensitive data is protected from unauthorized access. Compatibility testing verifies the system's performance across different browsers and devices, while acceptance testing evaluates whether the system meets stakeholder expectations. The system's accuracy, efficiency, reliability, scalability, and user satisfaction are key evaluation criteria to ensure it serves its purpose effectively, providing a robust solution for class scheduling at Aemilianum College Inc.

Table 4.10 - Overall Evaluation of the Developed System

Characteristics	IT Experts (10)	End-users (2)	Weighted Mean	Interpretation
Functional Suitability	2.8	2.9	2.9	Meets expectation
Performance Efficiency	3.55	3	3.27	Meets expectation
Compatibility	2.5	3.5	3	Meets expectation
Usability	3.5	2.97	3.16	Meets expectation
Reliability	3.37	3.35	3.36	Meets expectation
Security	2.96	3.1	3.03	Meets expectation

Maintainability	3.32	3.4	3.26	Meets expectation
Portability	3.6	3	3.16	Meets expectation
Overall Average	3.2	3.15	3.17	Meets expectation

Table 4.10 summarizes the Overall Evaluation of the Developed System, highlighting the system's performance across various characteristics as rated by IT experts and end-users. The system generally meets expectations across the board, with weighted means ranging from 2.9 to 3.6. Notably, Performance Efficiency and Portability received the highest ratings, with weighted means of 3.27 and 3.16, respectively, indicating strong performance in these areas. However, Functional Suitability and Compatibility were rated lower, with weighted means of 2.9 and 3.0, suggesting that these areas may require further refinement to better meet user and technical expectations. The system's Security and Maintainability also received moderate ratings, indicating satisfactory but not exceptional performance in ensuring data protection and system upkeep.

Findings

During the development and after testing and evaluation of the developed system the following findings have been established.

1. The Automated Class Scheduling System effectively manages faculty loadings, class programs, faculty schedules, and room utilization, streamlining the scheduling process and ensuring optimal resource allocation.
2. The Admin Module efficiently handles user management, class scheduling configurations, and system settings, allowing administrators to manage user roles, maintain departmental schedules,

The Overall Average rating of 3.17 reflects a system that meets expectations overall, with both IT experts and end-users expressing similar levels of satisfaction. While most of the characteristics were rated positively, Functional Suitability, Compatibility, and Security stood out as areas where the system could benefit from further improvement to fully align with user needs and expectations. Nonetheless, the system's Usability, Reliability, and Performance Efficiency ratings demonstrate that it is a dependable and user-friendly solution. Focusing on the areas identified for improvement could further enhance the system's effectiveness and ensure it provides an even more seamless experience for both technical users and end-users

- and customize scheduling criteria and constraints to meet institutional needs.
3. The integration of report generation within the system successfully provides comprehensive summaries of teaching loads, class programs, faculty schedules, and room utilization, facilitating data-driven decision-making and efficient resource management.
4. The developed system meets the ISO 25010 industry standards in terms of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, achieving a 3.17 overall mean

from the evaluators, which reflects that the system meets expectations across all quality attributes.

Conclusions

Based on the findings of this study the following conclusions were formulated:

1. The Automated Class Scheduling System effectively managed faculty loadings, class programs, faculty schedules, and room utilization, streamlining the scheduling process and ensuring optimal resource allocation.
2. The Admin Module efficiently handled user management, class scheduling configurations, and system settings, allowing administrators to manage user roles, maintain departmental schedules, and customize scheduling criteria and constraints to meet institutional needs.
3. The integration of report generation within the system successfully provided

comprehensive summaries of teaching loads, class programs, faculty schedules, and room utilization, facilitating data-driven decision-making and efficient resource management.

4. The developed system met the ISO 25010 industry standards in terms of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, achieving a 3.17 overall mean from the evaluators, reflecting that the system met expectations across all quality attributes.

Recommendations

Based on the conclusions drawn from this study, the following recommendations were formulated:

1. The Automated Class Scheduling System successfully updated the management of faculty loadings, class programs, faculty schedules, and room utilization, ensuring efficient resource allocation.
2. The Admin Module effectively allowed administrators to manage user roles, class scheduling, and system settings, aligning the system with institutional requirements.
3. The report generation feature provided valuable insights into teaching loads, class

programs, faculty schedules, and room utilization, supporting effective decision-making.

4. The developed system met ISO 25010 standards across various quality attributes, with a 3.17 overall mean, demonstrating that it successfully met the evaluators' expectations.
5. The system's seamless integration of all features and functionalities demonstrated its overall effectiveness in improving the class scheduling process and enhancing operational efficiency.

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