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Design and Implementation of a Lecture Scheduling System

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Abstract

The lecture schedule is very important in the world of higher education. The lecture schedule enables lecturers and students to conduct a structured and well-planned teaching and learning process. Lecturers, students, faculty, and campuses can all benefit from a systematic lecture schedule that facilitates the lecture process. The lecture schedule's systematic approach can aid campus administration in obtaining lecture reports quickly and easily. In this study, the design and implementation of a lecture schedule system were carried out at the Faculty of Computer Science at UIN Imam Bonjol Padang. The Waterfall model is used as the research method, which begins with needs analysis and progresses to system maintenance, while UML is used to design the system. There are three actors in this system, namely administrators, lecturers, and ordinary users. The system designed for this study has been implemented and is accessible at https://jadwalin.uinib.ac.id/.

Keywords: Lecture Schedule System, Design System, Implementation System, Waterfall Model, UML, Computer Science.

1. Introduction

A system may be understood as a set of interconnected elements that operate together in an organized manner to achieve particular objectives. In contemporary organizational settings, systems are no longer viewed merely as technical arrangements, but as integrated structures that combine processes, human roles, and technological support. This perspective highlights that the effectiveness of a system depends not only on its design, but also on how well its components interact and adapt to dynamic organizational needs [1].

In the context of higher education institutions, systems play a crucial role in ensuring the smooth coordination of academic and administrative functions. Activities such as student enrollment, curriculum management, research administration, and performance evaluation require seamless integration between people, procedures, and digital platforms. As universities increasingly adopt information technology, systems evolve into complex socio-technical frameworks where collaboration, communication, and data sharing become essential elements. The ability of these systems to deliver accurate, timely, and relevant information significantly influences decision-making processes and overall institutional efficiency [2].

Furthermore, recent studies in information systems emphasize that well-structured systems contribute not only to operational effectiveness but also to strategic outcomes, such as knowledge creation, innovation, and organizational learning. An organized system enables institutions to manage knowledge flows more effectively, support evidence-based decision-making, and respond proactively to environmental changes. Therefore, the role of systems in higher education extends beyond routine operations, serving as a foundational mechanism for achieving long-term institutional performance and sustainability [1] [2].

Information refers to processed and contextualized data that can reduce uncertainty and support understanding, coordination, and decision-making within an organization [17]. Rather than being merely raw figures or isolated facts, information gains value when it is interpreted, organized, and presented in a way that is meaningful to its users [18] [19]. Its usefulness depends not only on the content itself, but also on several important quality dimensions, including relevance, accuracy, accessibility, completeness, and timeliness [20]. High-quality information enables individuals and institutions to respond effectively to changing conditions, minimize errors, and improve overall performance [13].

In the context of academic institutions, reliable and high-quality information plays a crucial role in supporting various administrative and academic functions. It is essential for managing teaching and learning activities, allocating financial and human resources, monitoring student performance, and facilitating communication among stakeholders [15] [16]. Furthermore, timely and accurate information ensures that operational and strategic decisions can be made efficiently and with greater confidence [13]. Research on information quality and user satisfaction indicates that the value of information is closely related to how effectively it supports users in carrying out their tasks within organizational settings. When information systems provide relevant and dependable information, users are more likely to experience higher satisfaction, which in turn contributes to improved organizational effectiveness and decision-making outcomes [3].

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An information system is an integrated arrangement of people, digital technologies, data resources, and procedures used to collect, process, store, and distribute information for organizational purposes. In recent literature, information systems are recognized not only as operational tools but also as strategic assets that enhance coordination, communication, and knowledge performance. Within universities, information systems play an important role in supporting academic services, improving administrative efficiency, and enabling better data-driven decision-making. Therefore, the application of information systems in higher education has become increasingly important as institutions seek to improve service quality and operational effectiveness [1] [4].

Scheduling is the activity of allocating limited resources, events, and time slots while satisfying a variety of institutional constraints. In educational environments, scheduling is especially complex because it must simultaneously consider lecturer availability, room capacity, course demands, student needs, and potential timetable conflicts. Recent studies on timetabling confirm that course scheduling remains a challenging optimization problem, often requiring mathematical models, metaheuristics, or hybrid computational approaches to produce feasible and efficient solutions. This complexity makes manual scheduling less reliable and less efficient, particularly in institutions with many courses and limited resources [5] [6] [7] [8].

A course scheduling information system can therefore be defined as a specialized information system designed to manage, automate, and optimize the preparation of lecture timetables in higher education. Such a system integrates course data, lecturer assignments, room availability, and time-slot constraints in order to generate schedules that are accurate, efficient, and minimally conflicting. Recent research shows that digital scheduling systems and optimization-based timetabling approaches can significantly improve academic administration by reducing human error, accelerating schedule generation, and supporting better resource utilization. For higher education institutions, the development of a course scheduling information system is thus highly relevant as a way to improve the quality, consistency, and effectiveness of academic scheduling processes [5] [6] [7] [8]. The purpose of this study is to design and implement a lecture scheduling system at the Faculty of Computer Science, Imam Bonjol State Islamic University, Padang. The system is made to present daily class schedules with three primary variables: rooms, study programs, and lecturers.

2. Research Methodology

Research and development (R&D) is the method used in this research. Research activities involve obtaining information on client needs (needs assessment), while development activities involve creating learning tools. The R&D method aims to create and validate the usefulness and effectiveness of the product, which may encompass technology, materials, organizations, methods, strategies, models, media, learning aids, and other components [9].

The waterfall model is used to design and develop this system. The Waterfall model is a structured and sequential software development methodology in which each phase must be completed before the next phase begins. This model follows a linear progression, ensuring that requirements are clearly defined at the beginning and systematically transformed into a final product through a series of well-defined stages. The Waterfall approach emphasizes thorough documentation, clear milestones, and a disciplined development process, making it suitable for projects with stable and well-understood requirements [10] [11]. In recent studies, the Waterfall model is still widely applied in information system development, particularly in environments where project requirements are fixed and changes are minimal. Its structured nature allows for better planning, control, and evaluation at each stage of development. Although newer methodologies such as Agile offer more flexibility, Waterfall remains relevant due to its simplicity, predictability, and ease of implementation in academic and organizational system development [12]. Next Waterfall Model on Figure 1.

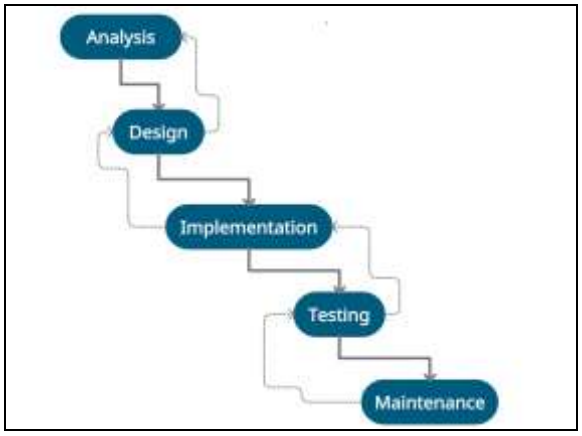

Figure 1. Waterfall Model [13]

3. Result and Discussion

During the system design phase, the author devised a lecture scheduling system that uses PHP/MySQL programming at the Faculty of Computer Science, Imam Bonjol State Islamic University, Padang, based on the data required. In this stage, system design is both general and specific, including output design, database design, technology design, and control design. Functional requirements are gathered from a system by using Use Case diagrams [14]. This lecture schedule system can be used by three individuals: the administrator, lecturer, and regular user. Admins are in charge of managing class, room, lecturer, and course data. Lecturers have the ability to view and print the lecture schedule, while regular users have limited access. This lecture schedule system's use case diagram is shown below on Figure 2.

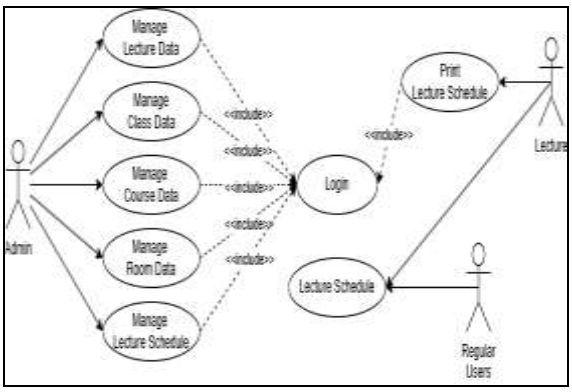

Figure 2. Use case diagram

The lecture schedule system developed is now operational on the website https://jadwalin.uinib.ac.id/. The Faculty of Computer Science's students and lecturers can benefit from this system, which allows them to stay up-to-date on the lecture schedule and support the lecture process and administrative needs. The lecture schedule can be viewed in a vertical view, as shown in Figure 3. This dashboard includes the ability to filter by room and study program, as well as search for lecturers, courses, and classes.

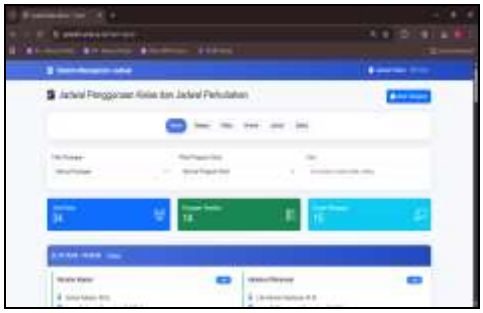

Figure 3. dashboard display

This system also provides a display of the lecture schedule in a table or matrix, which can be seen in Figure 4. A table is displayed with columns sorted by lecture hours and rows sorted by room ID.

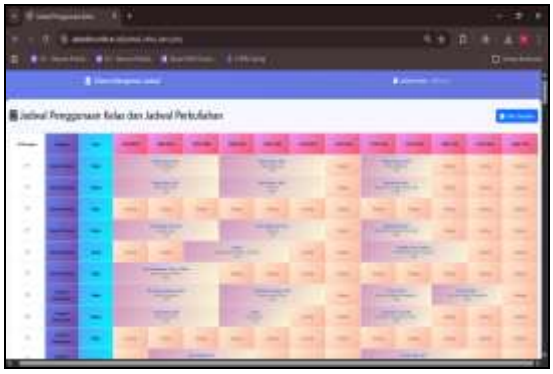

Figure 4. Table display

Admins and lecturers can log in by entering their registered username and password. The login page displays below in Figure 5.

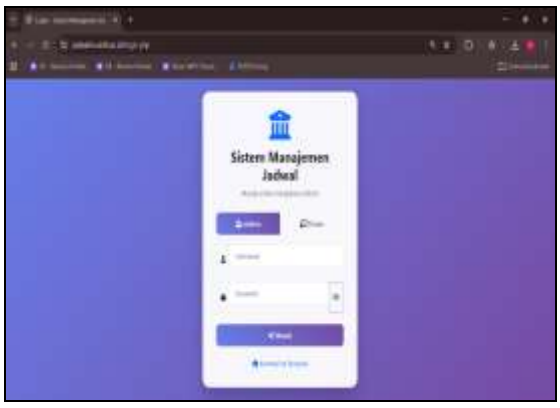

Figure 5. Form Login

After logging in, the administrator has the ability to manage data like class data, room data, lecturer data, course data, and lecture schedules. Admin's dashboard can be seen in Figure 6.

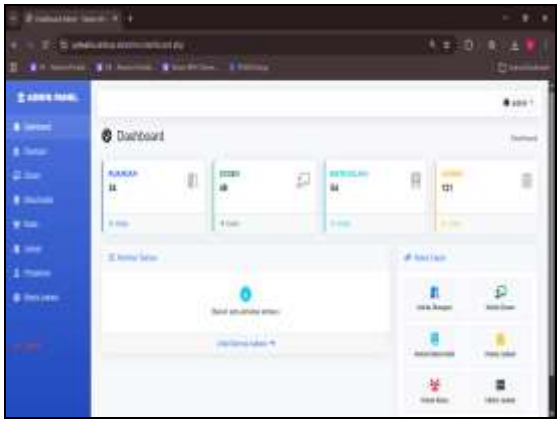

Figure 6. Admin's Dashboard

Admins can manage lecture schedules by inputting, editing, reading, and deleting room, lecturer, and course data. The system display can be seen in Figure 7.

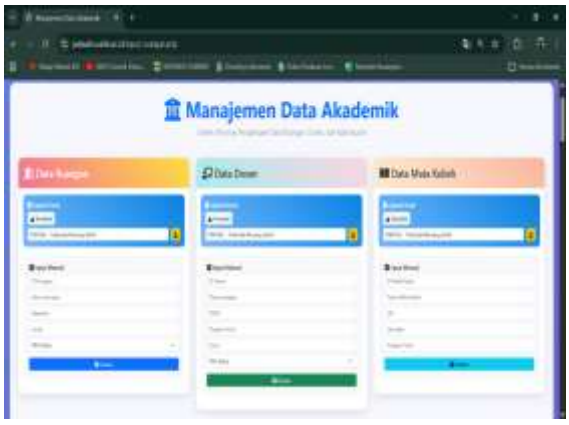

Figure 7. Admin's Managing Lecture Schedule

The data presented below pertains to rooms, lecturers, and courses in Figure 8

Figure 8: List of Data

And also after logging in, the lecturers has the ability to see lecture schedules and print it. Lecturer's dashboard can be seen in Figure 9.

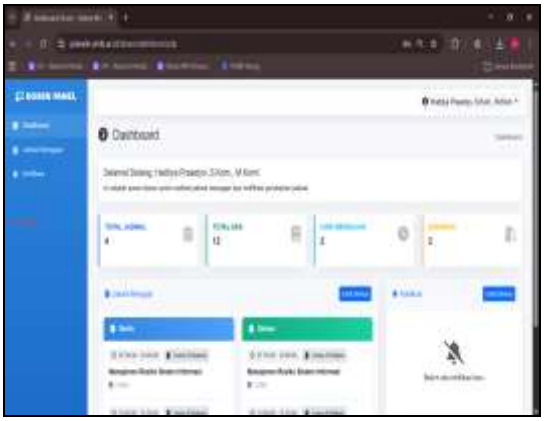

Figure 9. Lecture's Dashboard

4. Conclusion

The lecture schedule is a crucial element in lectures. The faculty and university can greatly benefit from a lecture schedule system that is both good and up-to-date. The lecture schedule management system that was developed at Imam Bonjol University's Faculty of Computer Science in Padang has been finished and implemented. The design of the system was accomplished through the use of UML and the programming language PHP. The lecture schedule management system is now online and can be accessed at https://jadwalin.uinib.ac.id/. This system can make it easier for the faculty to prepare lecture schedules, allowing lecturers and students to know their schedules every day.

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