THESISIT: WEB-BASED UNIVERSITY THESIS MANAGEMENT PORTAL WITH A DEFENSE SCHEDULING SYSTEM

*Ma. Esther B. Chio, Petal May M. Dal , Jocelyn L. Garrido, Arlene Baldelovar, JC Vanny Mill Saledaien
University of Science and Technology of Southern Philippines
email: maesther.chio@ustp.edu.ph

ABSTRACT: *Many students have difficulty deciding on research ideas, supervision, and administration processes during the thesis writing process are ambiguous and as a result, they are unable to graduate on time. Behind this complex activity is the faculty who prepare on plotting for their schedule on proposal defense and final oral defense, taking down minutes of defense proceedings, and gathering rating sheets and different thesis documents from different thesis groups. This system's main objective is to offer a portal that will make it simpler to follow and finish the thesis cycle. Part of the thesis cycle is the scheduling of oral defense by the students to the panel members; automating the defense scheduling is a key to fast track the thesis cycle process. The automated defense schedule in this paper is implemented using a genetic algorithm. To evaluate the system's functionality and usability, standard usability tests are carried out. Results show that 94% of the system is appropriate and recognizable and the system's overall functionality is 84%. Hence, the study on automating the thesis cycle, which includes automated defense scheduling, can address the problems in the execution of theses document gatherings, retrieving defense minutes, and scheduling oral defense presentation*s.

Keywords: thesis management system, automated defense scheduling, thesis repository

INTRODUCTION

A bachelor's degree requires students to write an undergraduate thesis, which is a scientific paper. Many students have difficulty deciding on research ideas, and supervision and administration processes during the thesis writing process are ambiguous as a result they are unable to graduate on time. Behind this complex activity are the faculty who prepare on plotting for their schedule on proposal defense and final oral defense, taking down minutes of defense proceedings, and gathering rating sheets and different thesis documents from different thesis groups. This preparation is a tedious task that involves the entity of faculty as adviser or panel as a matrix to thesis groups with respect to their defense schedule. The processes at this stage must run smoothly and properly so that both the students and faculty can benefit from a document management system. The system is comprehensive, and its thesis process, as well as the management of various thesis documents. This system's main objective is to offer a portal that will make it simpler to follow and finish the thesis cycle.

A system that serves as a doorway to other systems is called a portal. A centralized location for accessing various resources on the internet [1]. It collects information from various sources and puts it all together gathered in a single location that can aid in accessing information contributed by many users. It gives users what they want. Content, data, and services may all be found in one place. It can be altered to suit the user's preferences a position with the company[2].

Nowadays automated scheduling systems have been widely used by different institutions. Chess tournaments for example use an automated scheduling system to generate rounds depending on players ranking and data. For nurses to minimize duplication of duties, hospitals have used automated nurse scheduling. For its personnel, some eateries use an automatic scheduling system. And universities have been using automated scheduling systems for generating class schedules. Scheduling manually has also been difficult for humans to handle especially on large scale data. This concerns that scheduling manually has always been a problem in terms of accuracy and time. According to, [3] Scheduling is a real-life combinatorial problem that entails planning a specified number of occurrences over a set period. It has been [4] cited that scheduling has been the subject of intense research for several years now [4]. This led researchers to study many scheduling problems and apply it to machines. Scheduling problems arise in many areas of human endeavors, such as transportation, workforce (e.g. Nurse scheduling), education, sports, and so on [3].

In Universities like the University of Science and Technology of Southern Philippines(USTP), automated scheduling systems do exist. When a student enrolls and submits their important details, the system will generate a timetable that presents the student's schedule of classes. This system has always been precise in terms of duplications. A student cannot be scheduled in a class with him/her being present also in the same class.

Statement of the Problem

The current procedures were observed as implemented in this University during the conduct of students' research study towards their oral defense which entails the following cumbersome effects:

(1) The Chairman had a problem with scheduling thesis groups, advisers, secretaries, and panels manually due to possible conflicts on a parallel defense session setup. There are cases that a panel/adviser and the secretary were scheduled in two thesis groups that are presenting at the same time; And there are cases where thesis groups are scheduled twice.

(2) The manual process of generating overall ratings takes up a lot of time since panels do not submit at the same coming from individual repositories.

(3) The Secretary's record of the minutes and comments/feedback/suggestions from the panels during the defense is kept in their repository thus, this process makes it hard for the secretary to disseminate the panel's evaluation to the thesis groups on time. And possesses a higher possibility of documentation being lost.

(4) The Researcher/Proponents have a hard time accessing the evaluation information given by the panels, advisers, and secretaries which are saved in their repositories.

(5) University Research Director/ College Dean has limited information on the Thesis Titles of the Colleges where multidisciplinary research and or collaborative study is

possible. Thus, can be utilized for external funding and extension projects toward community linkages.

Objectives

The study aims to develop a web-based university thesis management portal with a defense scheduling system. Specifically, this aims to:

(1) design a web-based thesis management portal;
(2) develop a web-based thesis management portal with automated defense scheduling using a genetic algorithm; and
(3) test and evaluate the usability and functionality of the system using the ISO/IEC 25010 instrument.

Scope and Limitation

This study focuses on the development of an online repository for university theses where students enrolled in the course can upload and submit their pertinent documents as part of the requirements of the course. Then, the assigned adviser and panel members can view and give comments on the submitted documents through the portal. Also, the department chairman can monitor the progress of each group and their status and be able to generate an oral defense schedule automatically. The automated schedule is being done with the use of the genetic algorithm. Then, completed theses can also be viewed by the college dean and research director for possible research collaboration in future works.

On the other, the system cannot suggest possible research topics based on the completed theses. It cannot assign an adviser and panel members to a group based on topic niche or specialization.

Research Framework

Figure 1 shows the system architecture of the study which circulates from the database to the users (Chairman/Admin, Adviser/Panelist, Student, Secretary, Dean/Director).
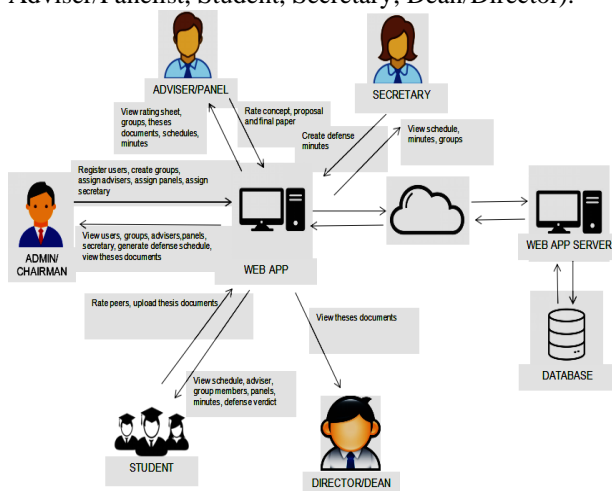
Figure 1. System Architecture of Web-based Thesis Portal

REVIEW OF RELATED LITERATURE

Undergraduate and graduate theses are the culmination of the student's academic coursework. Part of the compliance of the thesis is presenting it to a group of panels through a defense. Hence, the need for scheduling a thesis defense is an integral part of the completion of the course. The need for automated

scheduling is essential to properly accommodate all students who are undertaking the course and needs to comply with it within a specific period and for the assigned panels to attend the defense. The following are the studies that shows the importance theses management system and automated scheduling in thesis defense:

The Course Scheduling problem is a constrained, multi-objective optimization problem that has been proven to be an NP-complete problem, which is usually solved by genetic algorithms, but the effect is not satisfactory. The proposed genetic algorithm is based on a paired with coloring and tabu search the idea of automatically scheduling additional comprehensive worldwide lookup using genetic utilizing algorithms and local tabu search optimization, rapid convergence, and prevention local optimization, the more beneficial the outcome [4].

The forward chaining heuristic strategy is used in this research to represent and solve a dynamic resource allocation problem in automatic scheduling. Poor scheduling techniques would result in lecturers being assigned twice, presentations being postponed or canceled for an extended period, and inefficient use of time and resources. To meet the optimization criteria, this technique will use pre-defined logic rules and an algorithm. Among other things, the proposed algorithm for this automatic scheduling system might develop an appropriate presentation timetable and allow direct connection with lecturers to obtain data on their availability time. The proposed system works admirably in terms of accuracy, data handling, and adaptability in assisting faculty in more simply organizing presentations, producing a trustworthy record, and increasing resource efficiency [5].

Capstone projects have become a staple of many information systems degrees, both undergraduate and graduate. Tracking the process from the beginning to the end of the capstone might be difficult. This article describes the analysis, design, and implementation of a web application for a master's program in information systems approval workflow. The technology replaces a complicated, time-consuming, and error-prone paper form-based approach. The solution makes use of asynchronous JavaScript, responsive design, and clickable email links to provide a native-like experience on mobile devices while shortening the approval process. Reports at the program level assist administrative decision-making, and student statuses are maintained in a relational database [6].

This article describes the development of an electronic document management system for the College of Computer Studies at De La Salle University in Manila's Information Technology Department. The system controls the entire thesis process as well as document management for the numerous thesis documents. This system's main objective is to offer a portal that will make it simpler to follow and finish the thesis cycle. At the end of the development phase, a user test was conducted. The results of the user acceptance testing were successful. The study's difficulties were successfully resolved by the system [7].

Manual course scheduling is difficult and time-consuming, and it can sometimes break hard and soft limitations. As part of the timetable, soft limitations are frequently related to the instructor and student preferences. The goal of this research was to use genetic algorithms (GA) to prevent hard constraint

violations while minimizing soft constraint violations. In this study, the GA divided the population into several groups. The distributed GA was used to avoid the possibility of premature convergence in the original GA. In this study, the likelihood of migration was 0, 0.1, 0.2, 0.3, 0.4, and 0.5. The distributed GA was found to be successful in preventing hard constraint violations, minimizing soft constraint violations, and avoiding premature convergence [8].

Topics covered in the graduation thesis include title review, opening report, literature study, project design scheme, thesis writing, and communication. It is critical to re-explore and studies a system that is more suitable for the present thesis management job to better collaborate with colleges and universities to complete the thesis management. The solution addresses the inefficiency of currently available paper management systems and avoids the drawbacks of teacher-student linkage. A multi-level and comprehensive paper management system was accomplished using the integrated technologies of Spring + Spring MVC+ My Batis [9].

Several strategies for automating document management related to a degree project are presented in this thesis. The suggested system parses PDF documents and leverages information from the LMS to build a thesis cover and fill in the appropriate DiVA metadata automatically. The notification of the student's oral thesis presentation will also be entered into a calendar system, according to the instructions that will be provided. To handle thesis preservation and publication on DiVA more effectively and without errors, this thesis project's goal is to give KTH an automated system. By contrasting the results with previously entered metadata for theses that have been finished in DiVA, it will be possible to determine the accuracy of the retrieved meta data [10].

This study seeks to provide an academic scheduling system that solves the academic schedule using the Genetic Algorithm (GA). Academic scheduling takes into account several variables, including the lecture that will be given, the available space, the lecturers and their schedules, the suitability of the credits with the lecture time, and perhaps even the time of Friday prayers. Genetic Algorithms are capable of providing the optimum answer for some scheduling issues. The resulting system can appropriately automate lecture scheduling based on the test results. The effect of determining parameter values in a Genetic Algorithm on the production of a lecture schedule solution is also significant [11].

When it comes to arranging and conducting meetings, the university system has numerous challenges. The suggested system is for the institution to create and implement a Web-based paperless meeting management system. The proposed system would provide a meeting arrangement that will allow Kotelawla Defence University (KDU) to obtain meeting details or notify other meeting locations that can be accessed via the system. The Web-based paperless meeting management system (WBPMMS) was developed using HTML, Java, Android Studio, MySQL, Extensible Markup Language (XML), Cascading Style Sheet (CSS), JavaScript, and Web services Description Language (WDSL). The findings of this study also provide methods for overcoming challenges that may arise throughout the manual meeting management procedure [12].

University class scheduling is the process of assigning a location, teacher, and time slot to each class in a university calendar. With various constraints and goals, this is a highly combinatorial task. These objectives are frequently in rivalry with one another, which means that enhancing one metric may damage another. We present a web-based tool that may be utilized to assist in the scheduling process in this thesis. With this application, a timetable can be represented visually in a variety of ways. The user may be able to detect conflicts or problem areas more quickly with the help of these visuals. When using the calendar paradigm, changing the current timetable is a rather simple operation. An integer linear programming model is used by the automated scheduler to express the scheduling problem and its constraints [13].

In this paper, an improved evolutionary algorithm is used to address the multi-objective scheduling problem for college English classrooms. Experimental evidence has shown that the suggested approach not only has a faster convergence speed but also somewhat increases individual variety to broaden the search space and leave the local optimum. The improved genetic algorithm is faster and has a better average fitness value than the conventional genetic algorithm. The research for this paper has improved the management system for scheduling college English courses, as well as the fulfillment of education and teaching plans and the wise allocation of teaching resources [14].

Having a common repository of theses documents and automated defense scheduling is of great help for the students and instructors involved in the completion of the course for ease of document access and assignment of defense schedule. Moreover, integrating an automated scheduling scheme for thesis defense is an additional advantage for the adviser, panel members, and students. There are conditions that need to be addressed in generating a defense schedule, such as the adviser should not be on a panel at the same time, a panel cannot be present in two the same schedule, and the available time of each faculty member to sit down either as panelist or adviser is to be considered in generating the defense schedule. With the above-mentioned considerations, implementing a genetic algorithm in scheduling can generate the best-fit defense schedule for each adviser, panelist and students.

METHODOLOGY
Research Design
This web-based thesis management portal's system was developed utilizing the conventional waterfall methodology. The many stages of the investigation are listed below:

1. Data Gathering and Analysis
Data gathering will be done through interviews and online survey collection of information needed from the different colleges of USTP: College of Information Technology and Communication (CITC), College of Engineering and Architecture (CEA), College of Science and Technology Education (CSTE) and College of Technology (CT) such as policies and procedures (DPMs), sample forms and guidelines, previous defense schedule basis and identified problems. After data has been gathered and analyzed, the Proponent will then design the system flow accordingly.

2. Designing of Database and web-based management app. A database model is created to store data pertaining to the

repository of thesis documents, minutes, rating sheets, schedules, and the like. Figure 2 shows the database design. The use case diagram will be finished so that the graphical user interface (GUI) of the web-based application may be designed.
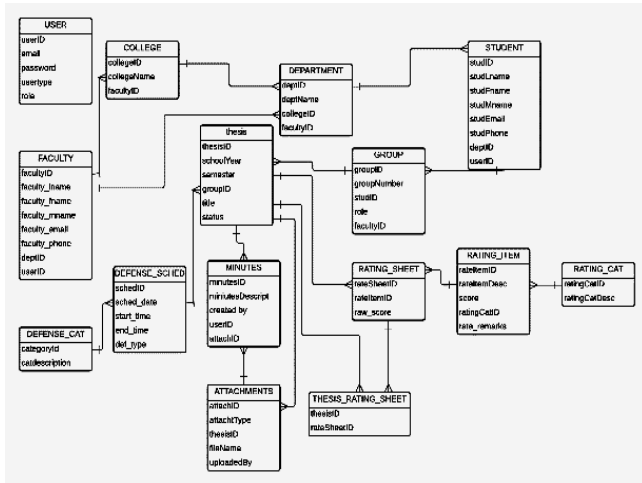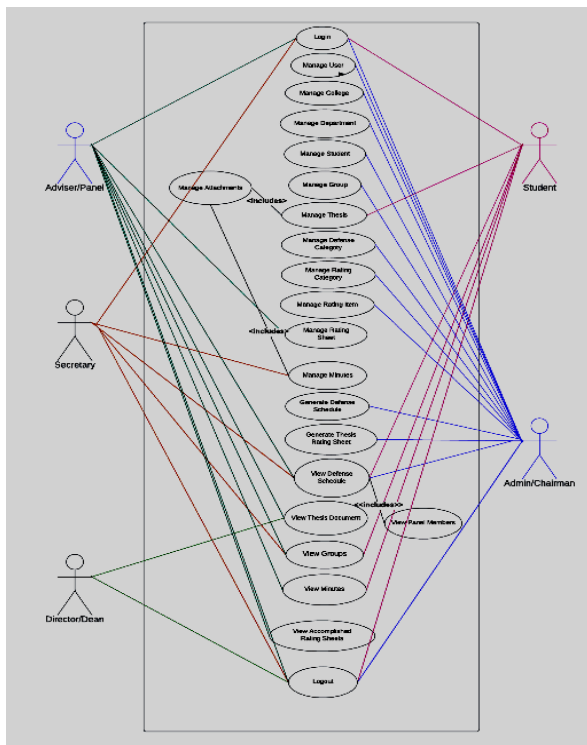

Figure 2: Database Design

Figure 3: Use Case Diagram

Figure 3 shows the use case diagram
3. Development and Implementation of University Thesis Management Portal

In developing the web-based Thesis management portal the Proponents will integrate technologies such as PHP, Ajax, HTML5, CSS, Javascript, and JQuery. This portal provides an interface for content uploading, storing, retrieval, and reports generation like rating sheets and oral defense schedules. The process of oral defense scheduling is automated using the Genetic algorithm. Figure 4 is the Genetic Algorithm

The framework that is used in the automated schedule generator.
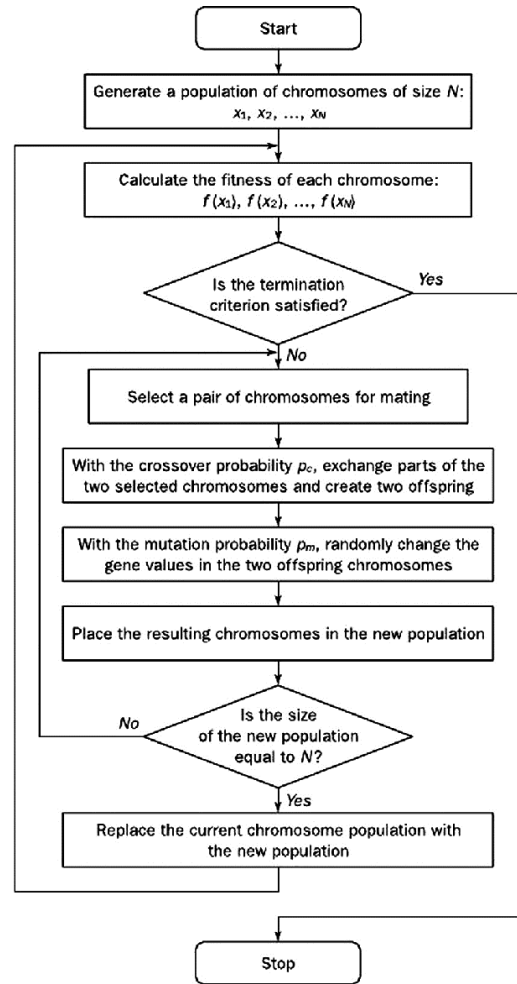
Figure 4: Genetic Algorithm Framework that is used in the automated schedule generator.

RESULTS AND DISCUSSION

Figure 5 is the snippets on the implementation of genetic algorithm to generate an automated oral defense schedule.

Figure 6 shows the administrator's schedule defense page. It as a timetable and defense schedule information for each group. The administrator can generate schedules by clicking the automatic scheduling button. It can also remove proposals and final defense schedules from the timetable.

Also, the department chairmen of the Department of Information Technology and Data Science are chosen to act as administrators and advisers, since they both can be the administrator, adviser, and panel member.

Based on the results of the usability test, approximately 94% of the respondents say that the system is user-friendly, meaning, easy to navigate, easy to learn, and appropriate to use.

Moreover, for the functionality test results, 84% of the user say that the system can achieve the different features needed to aid the thesis process cycle, which includes the generation of an automated defense schedule. Table 1 shows the overall usability and functionality tests result.

Table 1: Overall Usability and Functionality Test Results

STATEMENT	RATE				
	1	2	3	4	5
SOFTWARE USABILITY TESTING					
Appropriateness recognizability -The degree to which users can recognize whether a product or system is appropriate for their needs.	0%	0%	0%	3%	97%
Learnability -Degree to which a product or system can be used by specified users to achieve specific goals of learning to use the product or system with effectiveness, efficiency, freedom from risk, and satisfaction in a specified context of use.	0%	0%	0%	3%	97%
Operability -Degree to which a product or system has attributes that make it easy to operate and control.	0%	0%	0%	10%	90%
User error protection -Degree to which a system protects users against making errors	0%	0%	0%	7%	93%
User interface aesthetics -Degree to which a user interface enables pleasing and satisfying interaction for the user.	0%	0%	0%	3%	97%
Accessibility -Degree to which a product or system can be used by people with a wide range of characteristics and capabilities to achieve a specified goal in a specified context of use.	0%	0%	0%	8%	92%
SOFTWARE FUNCTIONALITY TESTING					
Functional completeness - Degree to which the set of functions covers all the specified tasks and user objectives.	0%	0%	9%	11%	80%
Functional correctness - Degree to which a product or system provides the correct results with the needed degree of precision.	0%	0%	0%	15%	85%
Functional appropriateness - Degree to which the functions facilitate the accomplishment of specified tasks and objectives.	0%	0%	9%	13%	87%

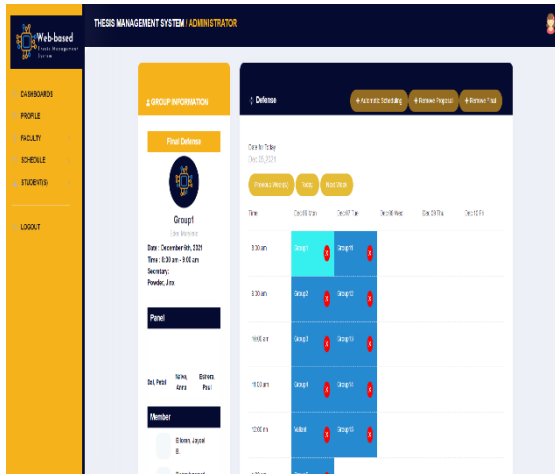**Figure 5: Genetic Algorithm Implementation Code Snippet**

Figure 6: Administrator's Schedule Defense Page of Web-based Thesis Management with Improved Defense

CONCLUSION AND RECOMMENDATIONS
Conclusion
The study can achieve its objective to develop a web-based university thesis management portal with defense scheduling system. The tedious process of going through the thesis cycle when done manually has been lessened with the aid of the online thesis management system. The burden of manually scheduling each group for oral defense has been reduced due to the automatic generation of defense schedule proved by the system. Moreover, it provides a repository for all the completed theses of the students in the University, thus giving an avenue for possible future research collaboration and mitigating the possibility of duplicating research topics by students.

Recommendations
The following can be used by future researchers to improve the current study:
(1) have predictive analytics for future research topic trends; and
(2) automatic assignment of advisers to groups based on faculty and student specialization.

REFERENCES
[1] Atlantic Webfitters. (2014). Atlantic Web Fitters.
[2] Eldrandaly, K. A. (2009). GIS AND SPATIAL DECISION MAKING. Nova Science Publishers, Inc.
[3] Arikpo, I. I. (2018). An Automated Scheduling System for University Lectures and Examinations. International Journal of Scientific and Engineering Research , 809-813.
[4] Yang, Y. O. (2011). Design of automated Course Scheduling system based on hybrid genetic algorithm. 2011 6th International Conference on Computer Science & Education (ICCSE). Singapore: IEEE.
[5] Fiarni, C. A. (2015). Automated Scheduling System for Thesis and Project Presentation Using Forward Chaining Method With Dynamic Allocation Resources. The Third Information Systems International Conference (pp. 209-216). Elsevier B. V.
[6] Grooms, J. D. (2016). Streamlining the Capstone Process: A Time-Saving Approval System For Graduate Theses/Projects. Information Systems Education Journal (ISEDJ), 81-96.
[7] del Rosario, E. J. (2016). CollaborateIT: A CCS IT Thesis Portal with Electronic Document Management System. DLSU Research Congress 2016. Manila.
[8] Saptarini, N. G. (2017). Senior high school course scheduling using genetic algorithm. Journal of Physics: Conference Series (pp. 27-28). Bali: IOP Publishing Ltd.
[9] Wang, S. P. (2018). Design and Research of Paper Management System Based in SSM Architecture. IOP Conference Series: Journal of Physics.
[10] Pour, S. B. (2018). Connecting Silos Automation system for thesis processing in Canvas and DiVA .
[11] Herman, L. S. (2019). Lecture Scheduling Automation Using Genetic Algorithm. International Journal of Engineering and Advanced Technology (IJEAT), 1444-1447.
[12] Bushman, K. (2021). Using Visualization and Integer Linear Programming for University Class Scheduling.
[13] Perera, P. a. (2020). A Web-based Paperless Meeting Management System. General Sir John Kotelawala Defence Univerity: 11th Internation Research Conference, (pp. 287-292). Sri Lanka.
[14] Xu, J. a. (2021). Improved Genetic Algorithm to Solve the Scheduling Problem of College English Courses. Hindawi Complexity.