AUTOMATED LECTURE TIMETABLE FOR NCE PROGRAMMES OF FEDERAL COLLEGE OF EDUCATION, OBUDU, CROSS RIVER STATE, NIGERIA

[1]Eneji, Samuel Eneji   [2]Kayang, Grace Patrick   [3]Angib, Maurice Udie
[1]Principal Lecturer   [2]Senior Lecturer   [3]Principal Lecturer
[1]Department of Computer Science Education
[1]Federal College of Education, Obudu, Cross River State, Nigeria

Abstract: Automation has become a major innovation in the digital ecosystem. Lecture timetable is one of the key aspects of the educational system. The use of manual procedures in the designing and deployment of lecture timetable is associated with anomaly such as overcrowding of students, repetition or omission of courses, high cost of production and others. This study under study the challenges with the manual process of lecture timetable planning in Federal College of Education Obudu, and came up with automated system to handle lecture timetable planning for the college. The designed system used Object Oriented Design for the system analysis and design. The system was tested using direct conversion and it was able to collect and collate data into a database, generate lecture timetable for both Main and Bebi campuses, allow users to filter timetable per school, department and year of study. It was concluded and that the deployment of the system in the college will go a long way to ameliorates the challenges associated with the manual lecture timetable planning, reduce cost of materials required and improve on efficient utilization of lecture timetable.

IndexTerms - Manual, Lecture, Timetable, Planning

INTRODUCTION

A lecture timetable is a table showing a set of placement of a set of meetings at a particular time and place, while a meeting is a combination of resources like rooms, People and times of equipment, some of which may be specified by a problem or allocated as part of the solution Etuh, Ajoda & Yusuf (2019). A timetable is a table displaying time events for activity to be executed in a given order and sequence, showing when particular events are to take place but do not necessarily imply an allocation of resources (Etuh, Ajoda and Yusuf 2019).

There are several fundamental differences on the timetabling problems depending on the subject and area of discuss for instance, University time tables are usually divided into two main categories, lecture timetable and examination timetable (Bloomfield and Mcsharry, 2018) lecture timetable has to do with set of meetings at a particular time and place in which resources are fixed together for a particular period for the sole purpose of delivery lecture to students. Over the times, lecture timetables are prepared manually and as such associated with human errors leading to challenges in implementation. An error or conflict occurs whenever a timetable requires any resource to be in two places at the same time (Soyemi, Akinode and Olorunhobi, 2017). Often times, students are overcrowded or underpopulated in a given lecture venue. At times, two or more course are assigned to the same venue, the same time and the same day. This often leads to conflict, at times quarrel between lectures who may not be patient or mature in resolving the conflict. At times, a lecture is assigned two or more courses at the same period which makes it difficult for them to sustain all the periods.

With human manual efforts in designing and developing the timetable, it takes much time and cost. Planning timetable manually involved some cost such as printing cost and time taken for the organization of the timetable which can be minimize with computerization (Hambali, Olasupo and Dalhatu, 2000). Automation is the order of the 2st century which is a key component of the digital world. Automation has been able to eliminate to the bearable minimum the weaknesses of manual operations. Automating lecture timetable will go a long way in increasing efficiency and effectiveness in lecture timetabling. It will as well reduce time required to produce lecture timetable manually as well as cost. Automated lecture timetable is simply the use of computer and its application in designing, preparing and disseminating lecture timetable. Automation of lecture timetable will limit challenges associated with the manual processes involved in timetable processing and give a more efficient and acceptable way of preparing lecture timetable (Soyemi, Akinode and Oloruntoba, 2017).

1.1 Statement of the Problem
Manual method of producing examination timetable is associated with a lot of challenges which can be corrected or reduce to a bearable minimum with computerization. The statement of the problem for the study include;

1. The manual method of planning examination timetable in FCE, Obudu is subject to many human errors such as duplication of courses, overcrowding, etc.
2. Omission of some courses in the examination timetable thereby affecting smooth conduct of examinations.
3. Inefficient allocation of venues to courses. A situation which leads to overcrowding in some lecture venues while others are free venues.
4. Allocation of the same venue to more than a course at the same period. This often leads to clash in examination which is not a healthy situation.

1.2 Objective of the Study
The main purpose of this study is to design and develop an automated examination timetable for NCE Programmes of FCE, Obudu.

The specific objectives of the study are;
i.   To create a database containing;
    a. All lecture venues and their sitting capacities for NCE programmes in FCE, Obudu.
    b. All courses and credit loads offered in NCE programmes of FCE, Obudu
    c. Students' enrolment per course in each department per session.
ii. Build a module that will generate academic examination timetable automatically
iii. Integrate academic examination timetable for each semester in the College Platform for access by students, lecturers and others as may be required.

1.3 Significance of the Study
The study will be of utmost benefits to students, lecturers and the college community at large. The students can access examination timetable with convenience as the softcopy of the timetable will be readily available and in circulation. Lecturers will be able to access the timetable with their handheld devices and can easily make references to it. It will address challenges associated with timetable planning in the college as a whole. It will reduce or eliminate time and funds spent in the planning of examination timetable and will make the timetable visible and available at all times.

LITERATURE REVIEW
2.1 Lecture Timetable
Lecture timetable is a table showing the times which a particular lecture is scheduled to hold and the venue in each day of the week (Ebieto, 2016). The contents of a lecture timetable include each course code, the lecture venue and the time for each lecture. A timetable is generated to assign a class teacher and students to a class at time slots (Veenstra, 2016).

The need for lecture timetable include (http://visionaryteacher.weekly.com):
i.   To place proper person at their proper places, at the proper time and in the proper venue.
ii. To prevent wastage of time and venue
iii. To show exactly what is to be done at a particular time
iv. To direct the attention of the students and teachers to one thing at a time

The essence of the timetable is to attain a smooth administration of the teacher-students class interface without obstacles. Over the times from experience and practice, it is observed that the manual timetabling processing is challenged with:

i.   Delay in communication of timetable to stakeholders
ii.   High cost of organization and dissemination of timetable
iii.   Wrong allocation of venues to a large crowd of students
iv.   Duplication of lecture period and courses
v.   Double or multiple allocation of clashes of period
vi.   Omission of courses in the lecture timetable

For effective administration of lecture in schools, the timetable should be planned such that above mentioned challenges are curbed.

2.2 Automated Lecture Timetable

Automated lecture timetabling is simply the application of computer in designing lecture timetable that can run on stand-alone-system or on the net. The use of computer in organizing set of activates to create a schedule that accommodates various constraints is an automatic lecture timetable (Frike, Bhabad, Haugarde, Magar and Tawlare, 2023). The use of computer to create a document that serves as a broad guideline for the time wise allocation of resources to subjects in order to reduce or eliminate conflicts in classroom allocation and time scheduling is automated lecture timetable (Faluyi Fele, and Ayeni 2022. Automated lecture timetable is a computerized tabular list showing the time, which a particular lecture is scheduled to hold and the venue in each day of the week (Etuk, Ajodoh and Yusuf, 2019)

To manage the complexity involved in designing of lecture timetable, there is the need to deploy computer and the net in designing and administering timetable in institutions. This will go a long way to solve the challenges involved with the manual tabling process.

Visionary teacher.com outlined the needs for automated lecture timetable in schools to include;

i.   Places proper person at their proper places, at the proper time aid in the proper venue.
ii.   Prevent wastage of time, energy and resources
iii.   Shows exactly what is to be done at any given time
iv.   Directs the attention of students and teacher to one thing at a time

Frike, et al (2023) noted that automated timetable will be of benefit as follows:

i.   Save time, efforts and resources
ii.   Ensure classes and courses never overlap, minimizing scheduling conflicts
iii.   Reduce administrative workload
iv.   Adaptive to adjustment without conflict
v.   Efficient allocation of classroom
vi.   Can be tailored to meet specific needs of each institution

Automated lecture timetable is advantageous in reducing labour, waste and it is flexible to manage and easy to effect corrections (Pandya, Chaudhary and Singh 2023).

This study aimed at seeking opinion of academic staff on the need for automated lecture timetable in Federal College of Education, Obudu.

METHODOLOGY

Object-Oriented Analysis and Design Methodology (OOADM) was adopted in this research work and it is a set of standards for system analysis and application design. It uses a formal methodical approach to the analysis and design of information system. Object-Oriented Design (OOD) elaborates the analysis models to produce implementation specifications. The main difference between Object-Oriented Analysis and other forms of analysis is that by the object-oriented approach we organize requirements around objects, which integrate both behaviors (processes) and states (data) modeled after real world objects that the system interacts with. In traditional analysis methodologies, the two aspects: processes and data are considered separately. For example, data may be modeled by ER diagrams, and behaviors by flow charts or structure charts.

The primary tasks in Object-Oriented Analysis (OOA) are:

- Find the objects
- Organize the objects
- Describe how the objects interact
- Define the behavior of the objects
- Define the internals of the objects

Common models used in Object Oriented Programing (OOP) are use cases and object models. Use cases describe scenarios for standard domain functions that the system must accomplish. Object models describe the names, class relations (e.g. Circle is a subclass of Shape), operations, and properties of the main objects.

3.1 Method of Data Collection

Data was gathered as follow:

1. Physical Assessment: the lecture venues will be physically assessed alongside with their sitting capacities and documented.
2. Records: records of students will be gotten from admission unit as contained in the admission list per session. The departments will also be used to ascertain information about students courses and combinations
3. Interview: time table planners of the college will be interviewed to get information on the peculiarity of timetable planning as applied to the Federal College of Education, Obudu.

3.2 Analysis of the Proposed System

The proposed system is a computerized version of the manual timetable planning process for NCE programmes in FCE, Obudu.

1. The proposed system creates a database of all lecture venues and the siting capacities, number of courses offered and their credit loads per semester, number of periods assigned for lectures per working days, number of enrolment per course, number of combinations and free periods per working day.
2. The system separates general and education courses from departmental.
3. The system automatically begins timetable planning by;
   i. Comparing available venues and merging combinations for general and education courses.
   ii. Considers favorable days as contained in the database and then creates examination timetable for the general and education courses per level, per semester.
   iii. Consider larger classes from the departmental and categorize them as large class.
   iv. The combinations that are few in numbers are also categorize as small class.
   v. The total number of both small and large classes are determined.
   vi. The system then assigns classes to courses for any given examination accordingly.
4. The finished timetable is generated as a table for physical examination by officer in charged.
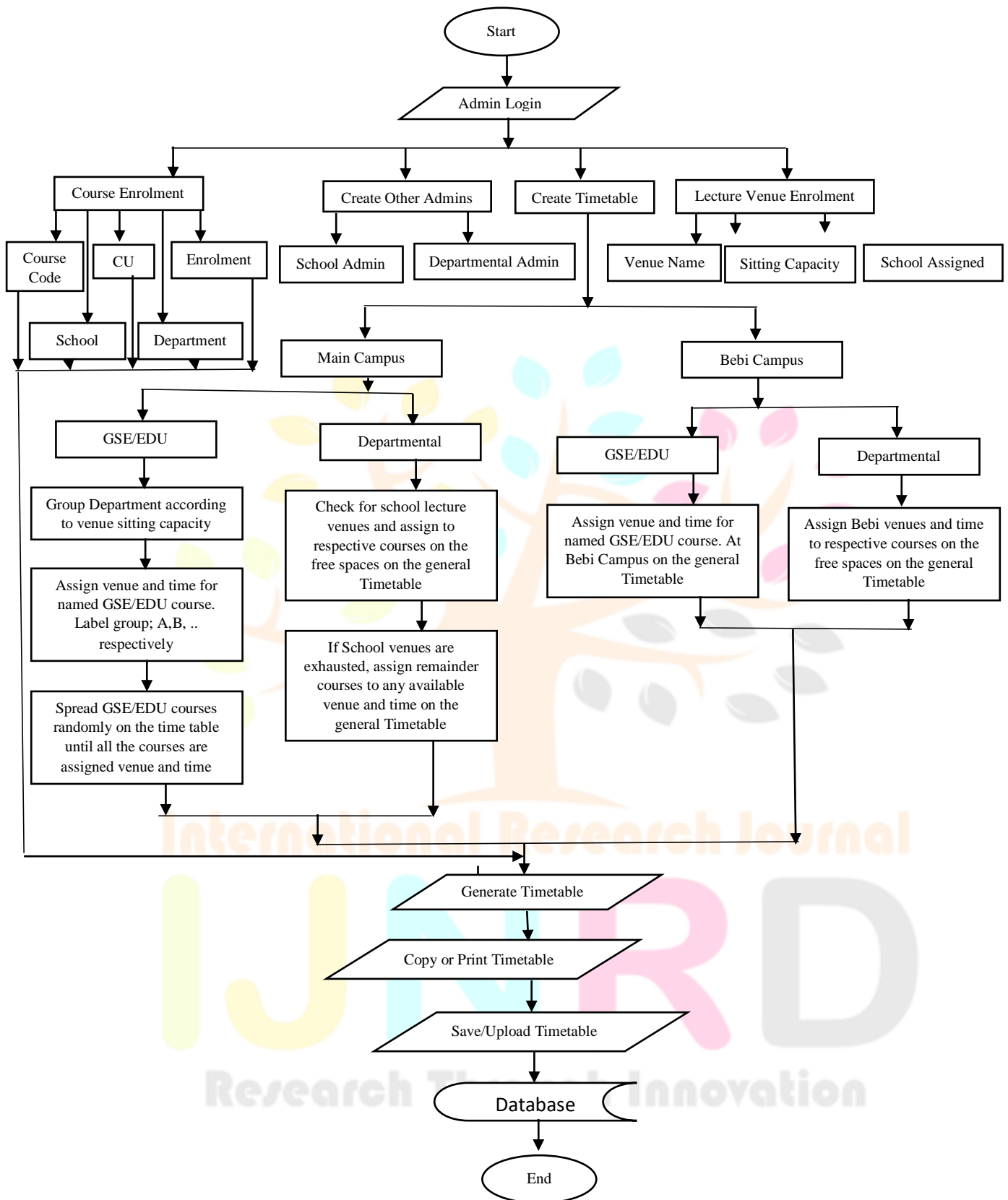5. A certified timetable is release for official use.

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                              ┌──────────┐
                              │  Start   │
                              └────┬─────┘
                                   │
                         ┌─────────────────┐
                         │   Admin Login   │
                         └────────┬────────┘
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Course Enrolment | Create Other Admins | Create Timetable | Lecture Venue Enrolment

Course Code | CU | Enrolment

School Admin | Departmental Admin

Venue Name | Sitting Capacity | School Assigned

School | Department

Main Campus | Bebi Campus

GSE/EDU | Departmental | GSE/EDU | Departmental

Group Department according to venue sitting capacity

Check for school lecture venues and assign to respective courses on the free spaces on the general Timetable

Assign venue and time for named GSE/EDU course. At Bebi Campus on the general Timetable

Assign Bebi venues and time to respective courses on the free spaces on the general Timetable

Assign venue and time for named GSE/EDU course. Label group; A,B, .. respectively

If School venues are exhausted, assign remainder courses to any available venue and time on the general Timetable

Spread GSE/EDU courses randomly on the time table until all the courses are assigned venue and time

Generate Timetable

Copy or Print Timetable

Save/Upload Timetable

Database

End

Fig.1: System Design for the New System

General Timetable Design

General Timetable for n semester of n session Federal College of Education, Obudu											
Day	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6
Mon											
Tue											
Wed											
Thu											
Fri											

Save	Print	Edith

Fig. 2: General Timetable Creation Window

N/B: Only Admin is allowed to Edith timetable, the table cell should contain all courses to include, General Education, General Studies and Departmental.

SYSTEM IMPLEMENTATION AND RESULT

The designed system is implanted in in modules. The modules include: main campus and Bebi Campus. Both campuses generate the general timetable, while the users have the option of filtering the result per school, department, and year of study.

The new system is web based and runs online. Once the Admin provides the needed data and save to the database. The rest work will be to query the database using the buttons provided at the interfaces to get what he or she wants as regards the college lecture timetable.

4.1 System Implementation Operational Guide

Caveat

All courses would be allocated a maximum period of 2 hours, so all courses with credit unit exceeding the value of 2 may be assigned additional hour manually.

Courses with no classroom hours allocated should not be entered into the system. Courses such as **project and teaching practice** falls into this category.

ONLY ONE SEMESTER WOULD BE AVAILABLE AT A GO. THE TIME TABLE MUST BE GENERATED EVERY SEMESTER

4.1.2 Initial Setup

- Name of the institution is the first thing that must be updated
- Choose the correct semester for which the current time-table is being administered (First/Second)
- Next is to make sure that all required academic levels are shown in the space provided. **If not, you are required to add new levels**
- All the campuses whose time table would be administered should be added next. **Click on the campus name under settings to manage the campus**
- Under the campuses are the lecture halls, these should be added next. All the lecture rooms belonging to the departments must be added too
- Departments also falls under campuses, so all departments under each campus must also be entered
- If there exist course combinations, click on the department names to create the course combination for each department. This is very important to the plotting of the time-table
- The next step is to add all the course offered in each department into the system. This can be achieved by clicking on the **Add Course** button
- All courses must be entered with their respective preferred lecture hall
- Courses can also be uploaded from a **csv** file
- Course appearing in **RED** colour indicates that the course is not plotted on the time table

- Please note that courses are not dependent on department but on campus. So a single course can be entered from 2 or more different campuses
- Only courses with the same level and same preferred lecture hall can be uploaded in the same file
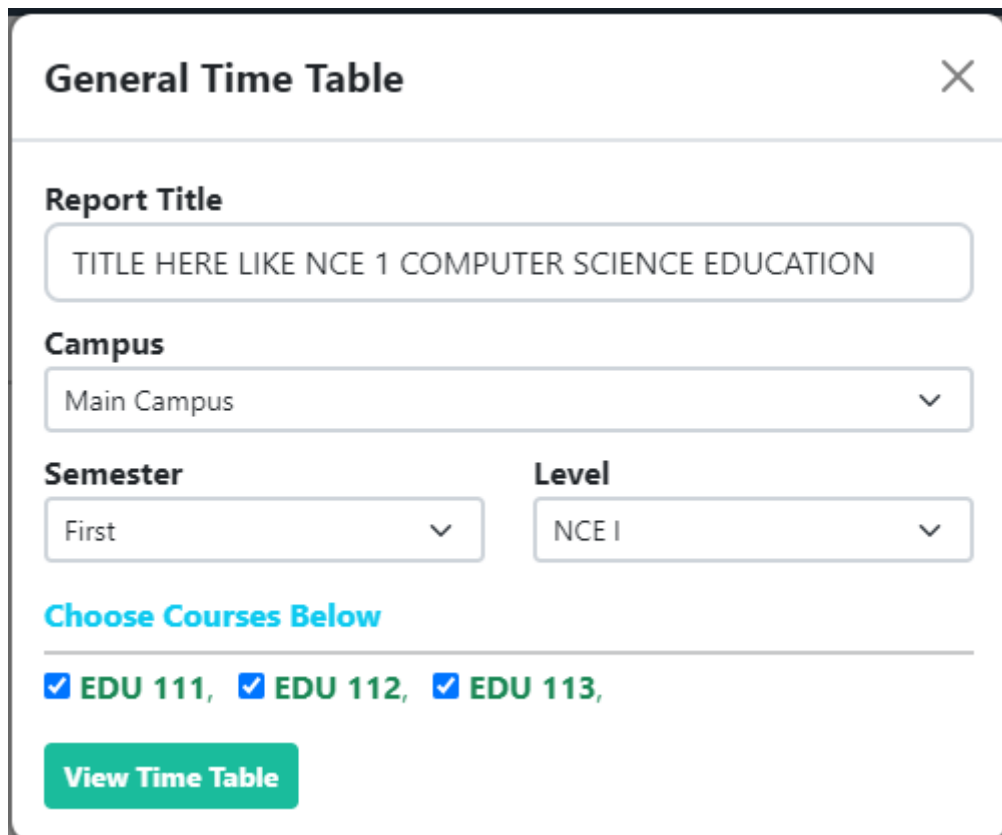
4.1.3 Other Instructions
- Clicking on **LECTURES' SCHEDULER** at the top banner would always return the user to the admin home page
- Time table would be generated for each study level one at a time. i.e The process would be repeated for each level of study until all the levels are covered

Fig. 3: Plot Timetable for First Semester Form

- In the Figure above, selecting **option 1** would remove all the previously plotted time table for the selected level and make new plots afresh
- Using option 1 will alwayss re-arrange the way the courses are placed on the time table please beware!
- Selecting **option 2** would not remove existing time table, but tries to plot those course that were not previous plotted on the time table
- **OPTION 1 MUST NEVER BE USED AFTER TIME TABLE HAS BEEN RELEASED TO THE PUBLIC FOR USE!**
- If a new course is added to the system after the time table has been plotted option 2 is the way to go.

4.1.4 Viewing Timetable
- There are 3 options that can be employed to see the time table
- Use the **Course Locator** option to see where a particular course appears on the time table.
- Use the **Lecture Hall Schedule** option to see the courses plotted for a specific lecture hall for a week
- Use the **Custom Courses View** to generate time table for a department
- To use the **Custome Courses View** option, all courses for the specific department and level must be chosen as shown in figure below

Fig. 4: General Timetable View Form

- Select all the courses related to your department and level and generate the time table for your department and level
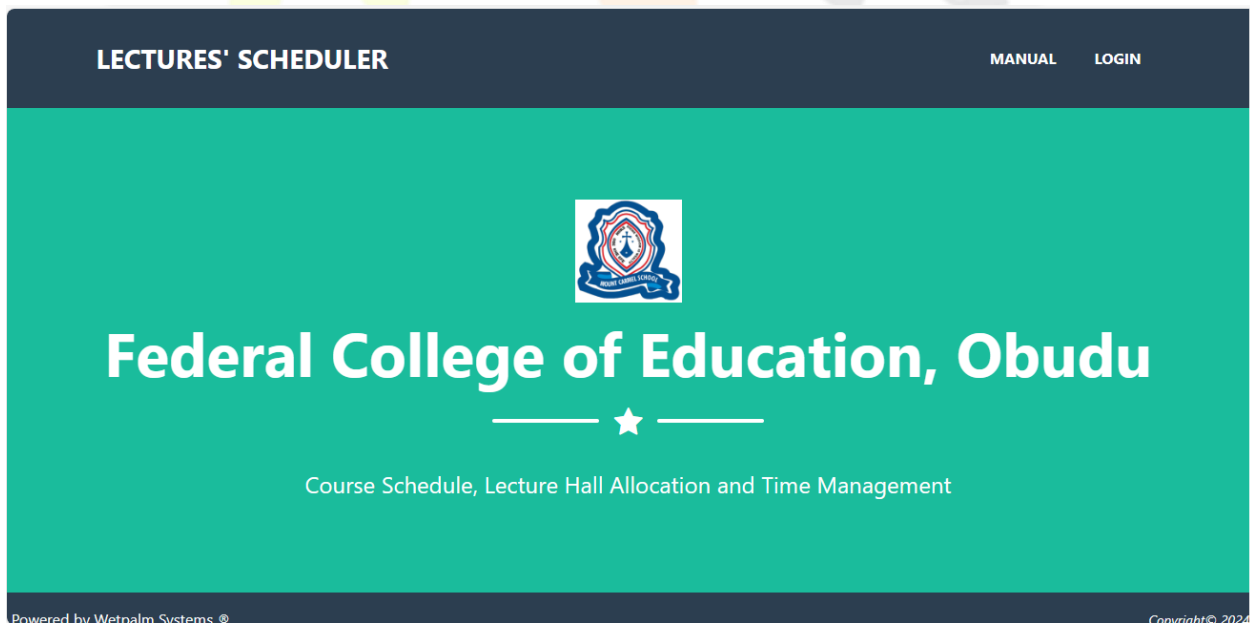

Fig 5: System Login Interface

This is the first screen loaded when the system is initiated. It provides users with opportunity to navigate the system.
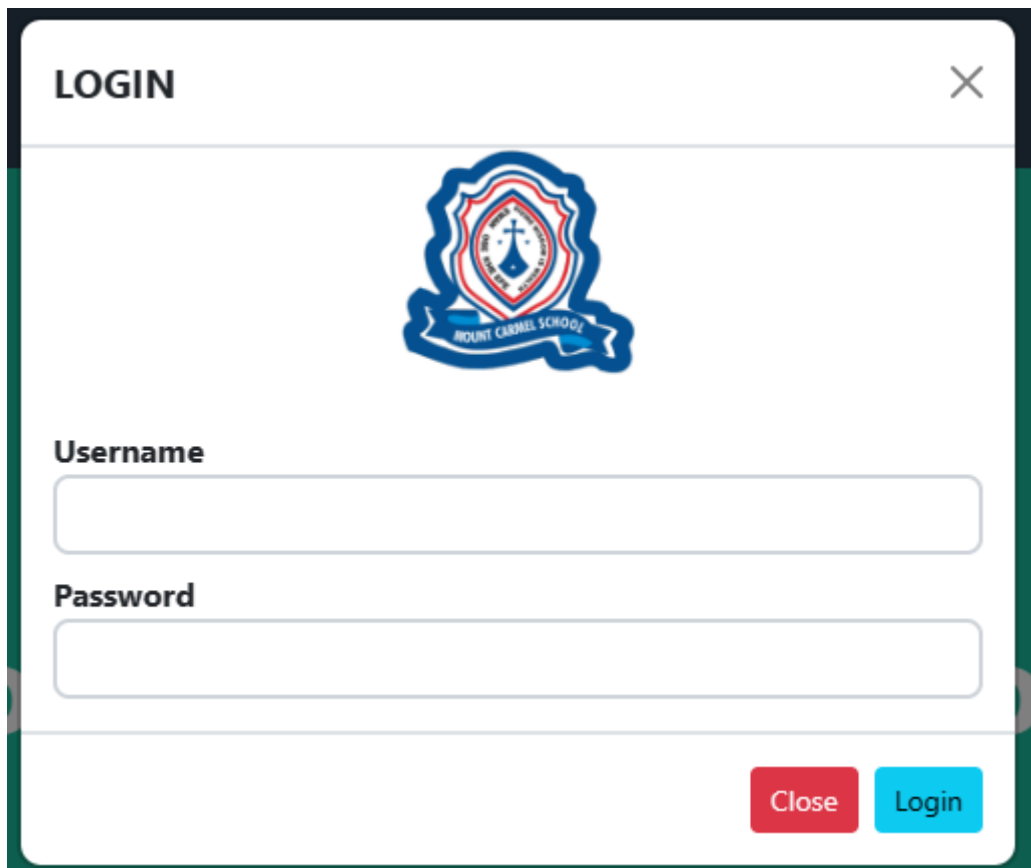
Fig 6: Admin Login

The Admin Login provides the System Admin with the interface to provide his login details. At the interface, the Admin is expected to provide his Username and Password. If the login details provided are correct, the Admin is granted access to the system resources.
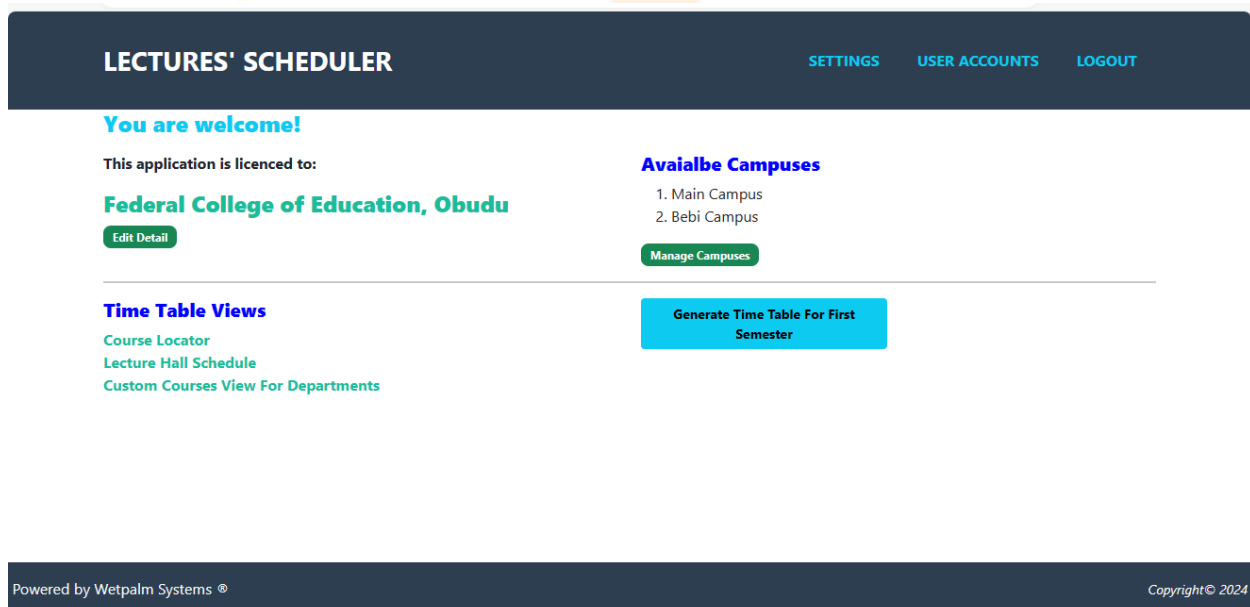
Fig 7: Navigation Interface

Figure 7 provides the Admin and any other user that is granted access by the Admin to select the operation so desired by viewing the options as displayed on the form and clicking on any of the desired options.

Fig 8: Year one Lecture Timetable filtered from the Database

Figure 8 shows a lecture timetable generated from the database for NCE 1 of the college Main Campus.

Fig 9: Year 2 Lecture Timetable Generated from the Database

Figure 9 shows a lecture timetable generated from the database for NCE 2 of the college Main Campus.

SUMMARY/ CONCLUSION

The study designed and implemented automated lecture timetable for Federal College of Education, Obudu. The designed system was able to collect and collate data into a database which in turn create room to query and generate lecture timetable for both campuses. The system creates the opportunity for lecture timetable to be filtered per school, department and per level.

The deployment of the system in the college lecture timetable planning will go a long way to ameliorates the college from the challenges caused by the manual lecture timetable planning, reduce cost of materials required for the manual lecture timetable planning and dissemination, and improve on efficient utilization of lecture timetable in the college.

References

[1] Etuh, E., O, F., and Ajoda, Yusuf, S. O, (2019). Design of Automated Departmental Lecture Timetable System. Review of Computer Engineering Research, 6(1), 24-34

[2] Bloomfield, S. A., (2018). Preferential Course Scheduling Interface. Accessed from https//doi.org/10.1287/inte9.4.24 on June 27, 2022.

[3] Soyemi, J., Akinode, J. and Olorunttoba, S. (2017). Automated Lecture Time-tabling System for tertiary Institutions. International Journal of Applied Information System (IJAIS), 12(5), 20-27.

[4] Hambali, A. M., Olasupo, Y. A. and Dalhatu, M. (2020). Automated University Timetable Using Heuristic Aprroach. Nigerian Journal of Technology (NIJOTECH), 39(1), 1-14

[5] http://visionaryteacher.weekly.com

[6] Frike, R., Bhabad, P., Gangarde, O., Magar, A. and Tawlare, A. (2023). Automatic timetable generation system. International Journal of creative research thoughts (IJCRT), 11(10), 455-460.

[7] Falmyi, B.I, Fele, T. and Ayemi, A.O (2022). Android lecture timetable application for tertiary institution. Journal of multidisciplanry engineering science and technology (JEMST) 9(3), 15174-15178.

[8] Pandya, P., Chaudhary, P.N and Singh, D. B. (2023). Automated college timetable generator. Accessed from www.jetir.org(ISSN-2349-5162) on March 13th, 2024.