



Development of an Enhanced Course Registration System for University Undergraduate Students

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Abstract

Keywords:

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Course Registration is one of the key activities of students during the studying period, hence the demand for an efficient course registration system cannot be over emphasized. A study into the existing course registration process in Adekunle Ajasin University, Akungba-Akoko, one of the leading State University in Nigeria reveals some limitations in their course registration system. Thereby, the existing system was analyzed and worked upon to improve its efficiency, and to meet the needs of the students and the university at large. In doing this, an enhanced students' course registration system that allow students to register for their courses with minimal error was developed by automating the course registration processing. The enhanced system was developed using an adaptive software development approach of the agile methodology and implemented with PHP (hypertext processor) and MYSQL database management systems using the Department of Computer Science, Adekunle Ajasin University as a case study. Results from the system when tested showed an improvement on the existing system, and have contributed in no small measure in reducing the stress that the students and result processing officers used to go through in the course of course registration and result processing respectively. The system can be used across the Departments of the University and other Universities in Nigeria.

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INTRODUCTION

One of the key activities in academic environment is the student' course registration. It is usually a web-based system provided via a school portal or centralized records management system aimed at making student' course registration in each semester of their studies easier and more convenient. Course registration system is typically pre-configured with the basic information such as the course list of every department for each programme level within the school, along with the corresponding course code, course units and the semester of the course (Al-Shaikh, 2010). It attempts to promote convenience to both the students and staff by reducing the stressful physical and manual processing that students go through each semester in registering the semester's

courses using a web based course registration services through the school based intranet or internet. In general, such a system provides for students and staff convenience, less paperwork and minimizes human errors that are associated with the manual course registration processes (Shreedevi et al, 2015; Akinbo and Agboola, 2020).

In as much as the registration of courses by students for a semester is a compulsory and essential part of the students' activities in every higher institution of learning, a course registration system should be able to reduce the chances of error during the registration process to the barest minimum for it to be considered efficient. At Adekunle Ajasin University, Akungba-Akoko (AAUA) just like every other universities in

the country, students enroll to pursue a 4-year or 5-year academic degree programmes. Some also enroll as direct entry students for a top-up leading to the award of a degree by starting their programmes from second or third year. There is a need for systems that will ease the stress and work load on the students, staff and the management in the course of studying and processing of students' results, one of these systems is a students' course registration system.

The current students course registration in the Adekunle Ajasin University, Akungba-Akoko allow students to register for their current semester courses by login into the system through the university's undergraduates portal and select the appropriate box against their chosen courses, with an option that allows for adding other course(s) from other levels in case of direct entry students and students with outstanding courses. This is then submitted online and a printout copy of the registered courses form is taken to the individual student's department and faculty for approval.

While the current system has brought some sanity and relief to the students in the process of registering their required semester courses and the staff in processing students' results, the system has also exhibited some deficiencies leading to the students' misrepresentation of information thereby costing them both monetary resources and time, and costing the staff (Level Coordinators) valuable times during the results processing. The most pronounced of these deficiencies are:

1. The system is unable to enlist all failed courses (outstanding courses from the previous semesters) by the students and does not compel students to register them before proceeding to the required current semester courses, this is because the system is not linked with the AVERS (the university's students' results system).
2. The system allows students to register for less or more courses credit units than required for a semester. For example, according to the university rules, a regular undergraduate student must register for a minimum of 15 and maximum of 28 credit course units per semester.
3. The system allows for improper registration of courses by the students, such as registering for courses outside the options or required courses for the semester or department in which the student is studying, or in some cases, registering courses that have previously been passed by the students.

In order to stay abreast of the newest trends, a user-driven course registration system is developed to meet the dynamic requirements of the users (the

university students and the staff). With the development of this enhanced course registration system, the data capturing, processing and storage are more efficient, effective and reliable, the final output in turn is more satisfactory to the users concerned, while the aforementioned deficiencies were carefully resolved.

LITERATURE REVIEW

Students' course registration system has long been an important interest to academia and non-academia, working within the higher institutions, particularly those at the Information and Communication Technology (ICT), Results Processing and Approving, and Bursary Units. For this reason, works on Students' course registration system has both a long history and a great deal of current activities. The review of such related works is carried out.

Ahmad et al (2001) looked at the evolution of online course registration systems with a particular emphasis on the processes and products. The aim of their work was to investigate whether the new registration system has been well integrated with the old processes. As a result, they looked in-depth at how the processes were being carried out before and after the implementation of the computerized registration system in an effort to determine if the implementation of the system had merely computerized a bad manual process or if it had taken advantage of the new systems capabilities that improved upon the old system rather than merely automating it.

Louis-Marie et al (2014) presented an Online Course Registration Systems Usability: A Case Study of the e-Lion Course Registration System at the Pennsylvania State University. The authors carried out a study on how to make electronic course registration systems more convenient and easier to use. The study looked at the e-Lion system at the Pennsylvania State University as a case study, and study data was collected using semi-structured interviews and an online survey. The findings were discussed through the lens of the DeLone and McLeane (D&M) information systems success model and are of interest to practitioners fielding online systems, particularly in the area of e-learning, providing considerable insight into the importance of system usability.

Bais et al (2015) developed a project registration and coursework management system named e-PRM to remove the inefficiencies associated with the manual registration and management of projects and coursework for the postgraduate students in the department of electrical and Electronic Engineering (JKEES) at the Faculty of Engineering and Built

Environment (FKAB), UKM, the department's earlier registration process method imposed difficulties and ineffectiveness to the project registration and monitoring processes due to the time expended on the manual system. The developed system is user-friendly and offers flexibility for supervisors to choose students. It also offers flexibility to students because they were able to suggest their project topics to a specific supervisor. The online assessment system further simplify the grading process and less time consuming compared to the manual system with notification through emails.

Amah (2015) presented a course registration and results processing system for undergraduate students at the University of Nigeria, Nsukka. The focus of the work was to meet with the demands for an effective and efficient course registration and results computation through semi automation results processing. The development of the system arose because of the growing rate at which students overstay in the school and the semi manual result computation. A report of an investigation proved that the students overstaying was majorly caused by improper course registration and the manual method of result computation in the University.

The system activity was modeled with an object-oriented methodology and the system implemented with PHP (hypertext processor), a scripting language and MYSQL database management systems. The result of the research work was a system that automates the course registration and results processing for the Department of Computer Science, University of Nigeria, Nsukka.

Richard et al (2015) presented a student registration system for the Methodist University College Ghana. The existing system required students to be physically present on campus to do registration for each semester after the payment of tuition fees, with several alternatives in technological advancements, the research decided to find out which alternative would help eliminate the existing difficulties students go through in order to register for the semester courses. The existing system was analyzed leading to the design and development of an online course registration system that eliminated the physical presence of students on campus for semester registration purpose thereby improve the services of the University to students as well as cutting the overhead cost for the University.

Adigun et al (2015) presented a Mobile Application Based Course Registration Platform (MABCRP) designed and implemented to facilitate the process of students' course registration within a University system. The research has shown that academic institutions can make use of the opportunities presented by the mobile technology to make course

registration easier and affordable for students by developing mobile applications that can be used purposely for course registration.

The application was developed to serve as an alternative to web based course registration system being currently used by most universities. This intends to bring course registration closer to the students who are vastly great users of mobile devices. The developed mobile application enables students to register required courses per semester, view all registered courses and also to add or delete courses. Result of user evaluation of the developed MABCRP shows that it has a good usability in terms of usefulness and ease of use.

Singh et al (2016) developed an online student course registration system. The system was developed to reduce the strenuous and precious time consumed in filling the manual course registration at the some higher institutions in India by simplifying the procedures. The system was developed using PHP, jQuery, Apache and MySQL, consisting of five modules in total: Administrators, Masters, Transactions, Reports and Utilities. The front-end was developed using PHP with excerpts of codes written by jQuery and back-end was designed and managed using MySQL. The system was evaluated and was considered to be more secured, user-friendly and less time-consuming.

Ruben et al (2019) presented a web-based course registration system with an improved usability. The authors conducted series of user studies such as usability study to evaluate the course registration system at the MacEwan University (MyStudentSystem). Based on the study results, a prototype system that addressed the limitations of the studied systems was designed and developed. The summative evaluation results of the developed system showed that the design improved the overall system usability and user satisfaction.

Padia and Santani (2021) developed an online course registration system that provides a list of courses available according to the semester a student selects and indicates the courses one has selected. The system was developed using HTML, CSS, JavaScript, AJAX, and Bootstrap for the front-end and the MYSQL for the database. The system can be used as an integrative tool for many colleges and can be modified according to a college's requirements. It was evaluated and considered to be much quicker, efficient and the only force used is the clicking of a mouse button.

Anameje and Okeke (2021) developed and implemented a student registration system that enables students to register their semester courses without much pressure for the students and staff. PHP and MySQL were used in the development of the

system. It is a web-based system that takes care of students' registration, produces students' blacklist, quick report of students' results, provision for uploading and downloading course materials and departmental course allocation. It gives the department more value on admission, online result, students and staff inquiries. This system maintains all necessary information of the department using a centralized database which allow each staff to view significant information from anywhere outside the school premises.

RESEARCH METHODOLOGY

An Agile methodology was adopted for the research work. The author conducted users studies such as the usability and functionality studies on the current Adekunle Ajasin University, Akungba-Akoko students' course registration system, series of users interactions were also conducted with the system user

stakeholders (the students, the academic staff and the ICTAC staff) regarding the current system. The following activities were involved in the adopted methodology to ensure the success of the study: Data Collection; Data Analysis (analysis of the existing system and the users' interactions); Design of the enhanced system; Development of a prototype system and the Evaluation of the prototype system.

The data were gotten from the AAUA students' handbook, Faculty of Science's prospectus, oral interviews conducted with various stakeholders in the University, and the experimental reviewing of the current course registration system in use. The data were analyzed to identify the deficiencies and limitations of the system, the entities and possible roles of the entities. The system was designed using the Unified Modelling Language (UML) tool. The system's data flow chart is shown in figure 1 showing the information flow patterns within the system.

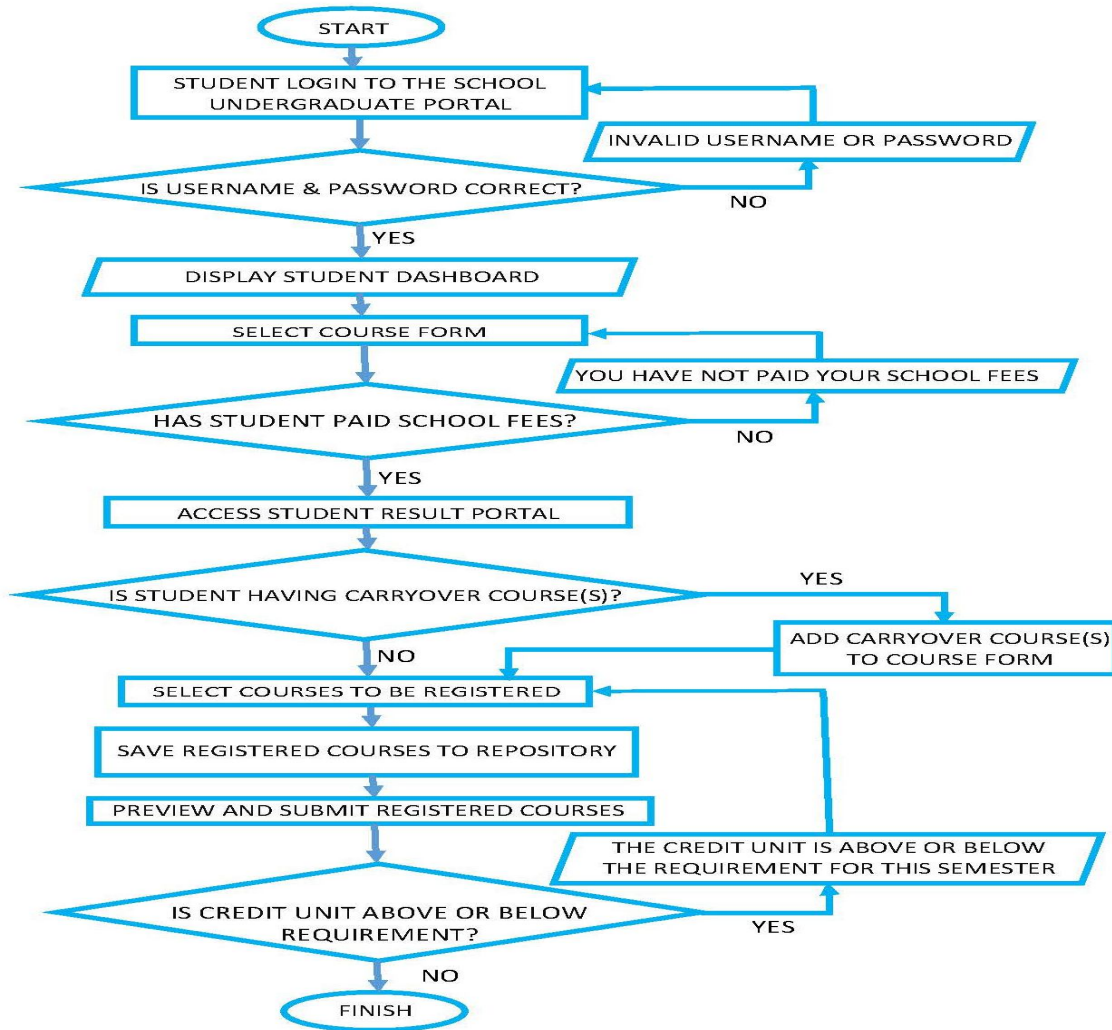


Figure 1: Data Flow Diagram of the System

The System Architecture

The system is a 3-tier web-based client/server Architecture in which the user interface, functional process logic, computer data storage and data access are developed as dependent modules, different platforms as shown in figure 2:

- a. **The Presentation Tier:** This level presents the user with the interface. It is the visible part of the system; it was developed with HTML and CSS.
- b. **The Middle Tier:** This serves as an intermediate layer between the user interface (the frontend) and the database (backend). It picks data from the user interface and inserts it into the database or processes it. It is developed with PHP.
- c. **The Database tier:** This is the third tier of the system architecture. It is the database that allows the insertion, storage and retrieval of any information. It was designed with MYSQL.

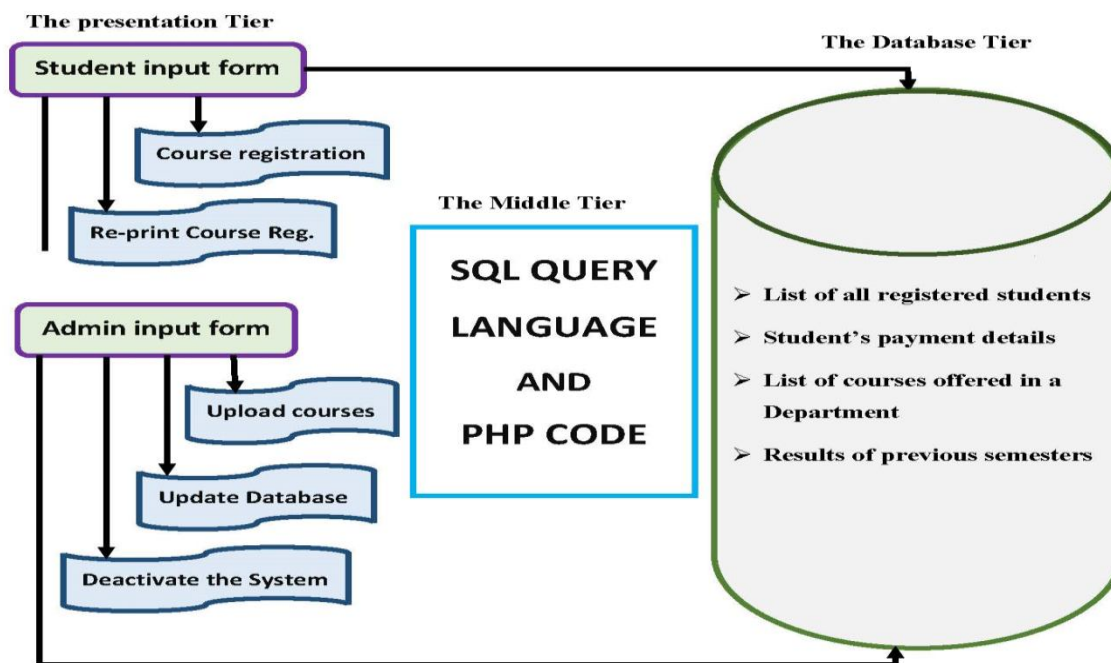


Figure 2: The System Architectural Design

Students Section

This includes all the operations that can be performed by students on the system which are as follows:

- a. **Course Registration:** Through the course registration subsection, students can register for the required semester's courses, these courses can include the student's outstanding courses from previous corresponding semesters i.e. if the student is registering for first semester courses, she/he can only register for outstanding courses from the previous first semesters only.
- b. **Re-Printing of Course Registration Form:** This provides a medium through which the students can access the course registration forms of all the semesters they have registered for and print it whenever they want. The student can access these forms either during that semester or thereafter, and whether the students course registration portal is opened or closed

Administrator(s) Section:

This section presents all the operations that can be performed by the administrator(s) in the system, these include the following:

- a. **Upload Courses:** At the beginning of every new semester, the system administrator upload courses to be offered by every department and their corresponding levels into the course form database, both elective and compulsory courses as well as the credit unit for each courses.
- b. **Update Database:** The administrator can equally add or delete courses according to the revised national universities commission (NUC) courses benchmarks and schools specifications. The registration_table contains the name and matric number of students together with the courses registered for in a semester. Only the administrator is authorized to access it.

c. **Deactivate the System:** The administrator is responsible for deactivating the course registration system at the end of every semester after the closure of the portal by the school management before opening for a new semester.

courses, level, department, semester and session. The create_account table shows the student's profile and their login details, the course_form table contains all courses that should be offered in the department by the student based on their department. The registered_courses table pulls data from the create_account table, the course_form table and sometimes result table. The result table is a combination of the student's biodata and the course registered, score and their respective grade. The system database design containing the available nine (9) tables is shown in figure 3.

The System Database Design

Database is a collection of entities with related information. In the design of the enhanced course registration system, the various related entities are: admin_login, student_login, course_form, result_table, registered_courses, stored_courses, create_account,

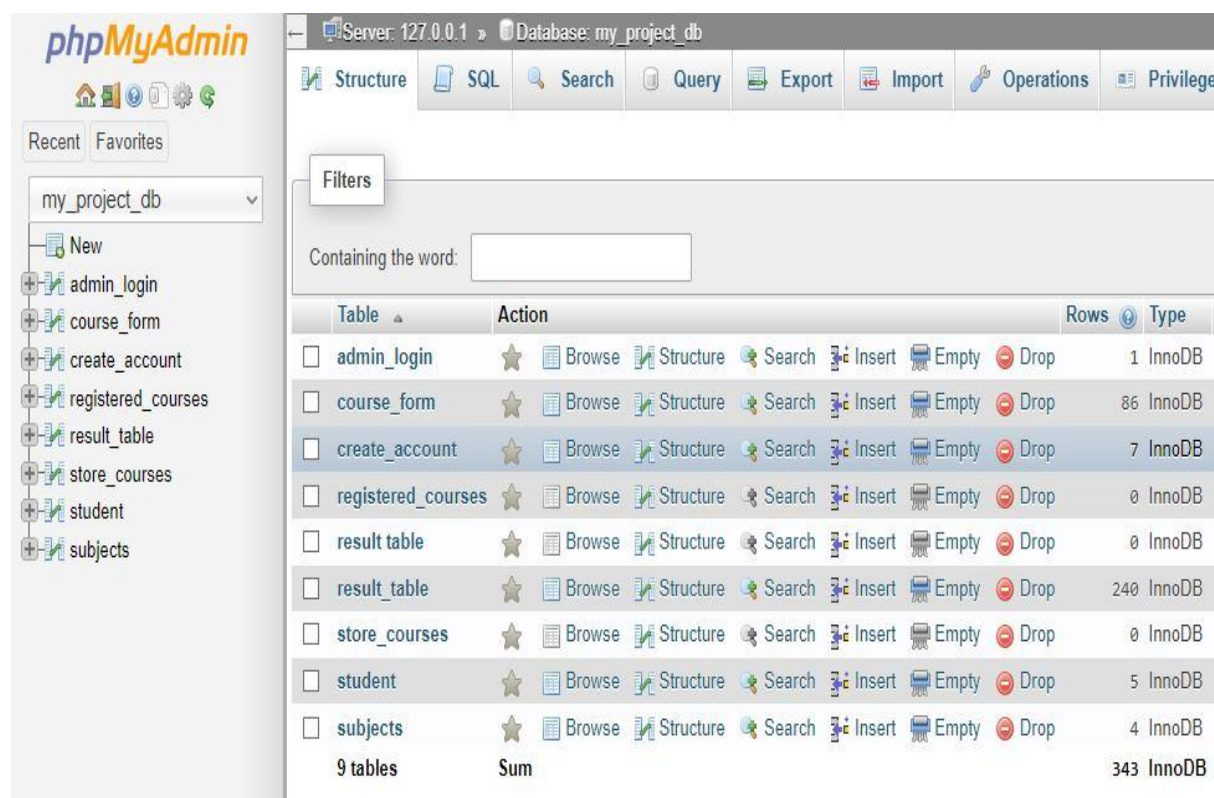


Figure 3: The System Database

THE SYSTEM IMPLEMENTATION

The development of the system was done using the WAMP (Windows-Apache-MySQL-PHP) platform. All entities of the system have been modelled as objects in order to separate their logic codes from presentational codes, and to isolate the database queries. Isolating the database queries makes it possible to make quick changes in the structures of the entities and to ease replacement of the underlying database platform which is currently MySQL.

With this separation, new entities and activities can be added to the system when needed. Thus the system becomes highly extendable and modular.

Figure 4 shows a diagrammatic representation of all components involved in the system and their linkages. Only two actors are guaranteed access to the system, the students and administrators of the system.

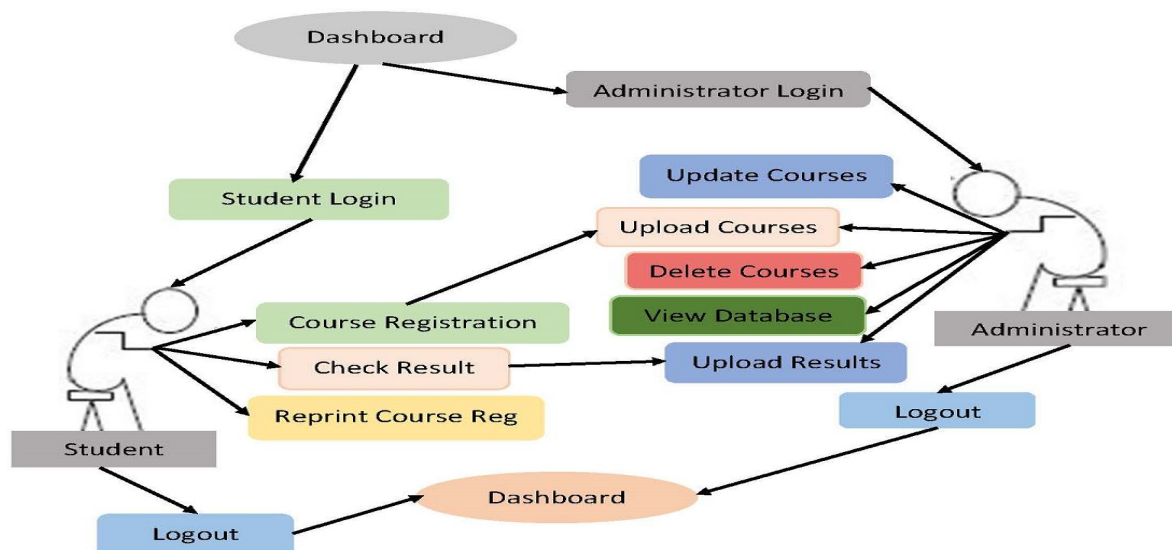


Figure 4: Diagrammatic Implementation Representation of the System

The Student Module

- The Student Account Creation Module:** this is the module that contains the student account creation interface. It enables a student to supply his/her Bio-data and create a login detail. In this interface every field is set as required and matric no and username are unique to every student. If the matric no or username exist, it returns an error message.
- The Student Dashboard:** This is an index file. After the student has login successfully, he/she is redirected to this page. It marks the beginning of all programming module and establishes a link

or connection string that connects to the other module files. Any student trying to access this page without login will be re-directed to the login page. The students' dashboard is shown in figure 5.

- The Course Registration Module:** This is the module where the changes made to the existing system are implemented. . It enables students to select courses he would offer for the current semester and session; it also allows students to view all registered courses. The students' course form that displays all the available courses for the current semester is shown in figure 6.

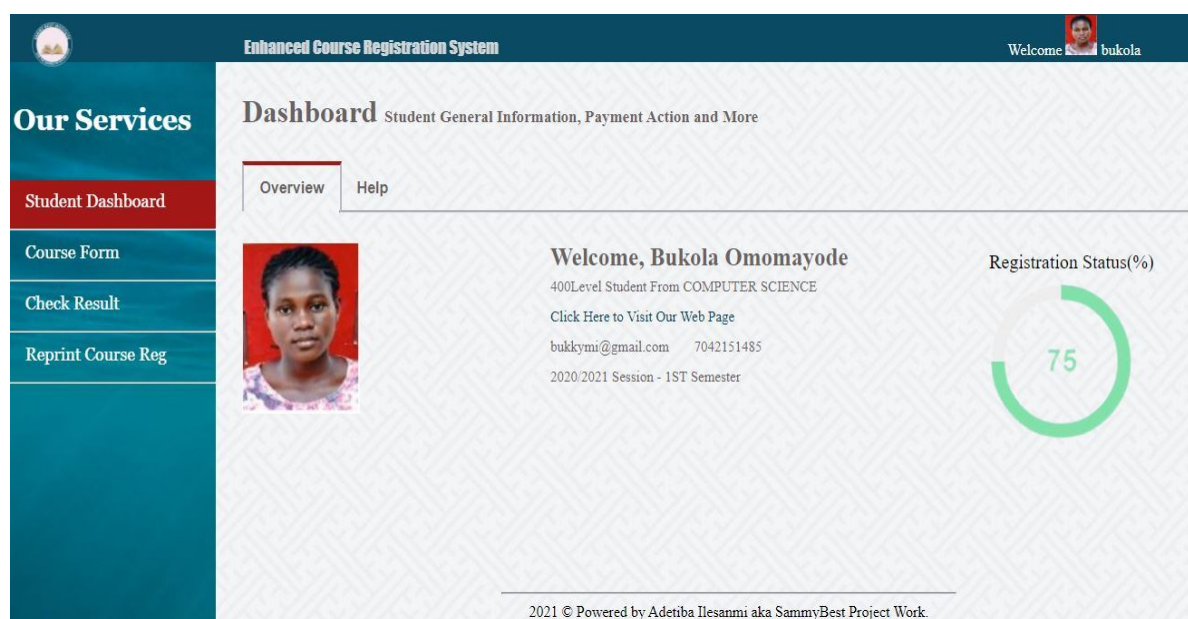


Figure 5: Student dashboard containing some basic student bio-data

Enhanced Course Registration System | Welcome legendsanmi

Course Registration Student course information

Course Registration Form

Student Information

Matric Number #: 190404105 | Student Name: Samuel Sunday
 Faculty: SCIENCE | Department: COMPUTER SCIENCE
 Level/Admission Mode: 300/DE | Semester/Session: 1ST/20202021

[Print Course Reg](#)

Course Information Please Select/Tick or Deselect/Untick the checkbox to Add/Remove Course information.

S#	Code	Title	Unit	Type	Tick
1	CSC 313	Automata Theory and Formal Language	3	C	<input type="checkbox"/>
2	CSC 323	Computer Networks	3	C	<input type="checkbox"/>
3	CSC 301	Computer Organization and Architecture I	3	C	<input type="checkbox"/>
4	CSC 321	Computer System Installation Management	2	E	<input type="checkbox"/>
5	CSC 303	Database Systems	4	C	<input type="checkbox"/>
6	CSC 319	Discrete Structures	2	C	<input type="checkbox"/>
7	CSC 317	Introduction to Computer Arithmetic	2	E	<input type="checkbox"/>
8	CSC 305	Object-Oriented Programming	3	C	<input type="checkbox"/>
9	CSC 311	Operation Research	3	E	<input type="checkbox"/>
10	CSC 309	Survey of Programming Languages	4	C	<input type="checkbox"/>

Total units: 29 units | **Registered Units =>** 0

[Save \(Add/Remove\) Course\(s\) and Add More](#) | [Submit and Preview Course\(s\)](#)

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Figure 6: Course Form for Registering Student’s Courses

After selection of the desired courses to register for by the student, the student clicks on the submit button, if the total selected courses credit units is less than the minimum unit or more than the maximum unit requirement for a semester which are 15 units and 28 units respectively, the system returns an error message

indicating that the minimum course credit units have not met or that the maximum course credit units have been exceeded without submitting the courses selected by the student as shown in figure 7 and figure 8 respectively.

Course Information Please Select/Tick or Deselect/Untick the checkbox to Add/Remove Course information.

Course Registration Failed!!! Because Registered Units is Below Minimum unit Requirement

S#	Code	Title	Unit	Type	Tick
1	CSC 313	Automata Theory and Formal Language	3	C	<input type="checkbox"/>
2	CSC 323	Computer Networks	3	C	<input checked="" type="checkbox"/>
3	CSC 301	Computer Organization and Architecture I	3	C	<input checked="" type="checkbox"/>
4	CSC 321	Computer System Installation Management	2	E	<input type="checkbox"/>
5	CSC 303	Database Systems	4	C	<input type="checkbox"/>
6	CSC 319	Discrete Structures	2	C	<input checked="" type="checkbox"/>
7	CSC 317	Introduction to Computer Arithmetic	2	E	<input checked="" type="checkbox"/>
8	CSC 305	Object-Oriented Programming	3	C	<input type="checkbox"/>
9	CSC 311	Operation Research	3	E	<input checked="" type="checkbox"/>
10	CSC 309	Survey of Programming Languages	4	C	<input type="checkbox"/>

Total units: 29 units | **Registered Units =>** 13

[Save \(Add/Remove\) Course\(s\) and Add More](#) | [Submit and Preview Course\(s\)](#)

Error message

Total credit units of the courses to be registered is less than 15units

Figure 7: Interface Indicating Total Credit Units is Below Requirement

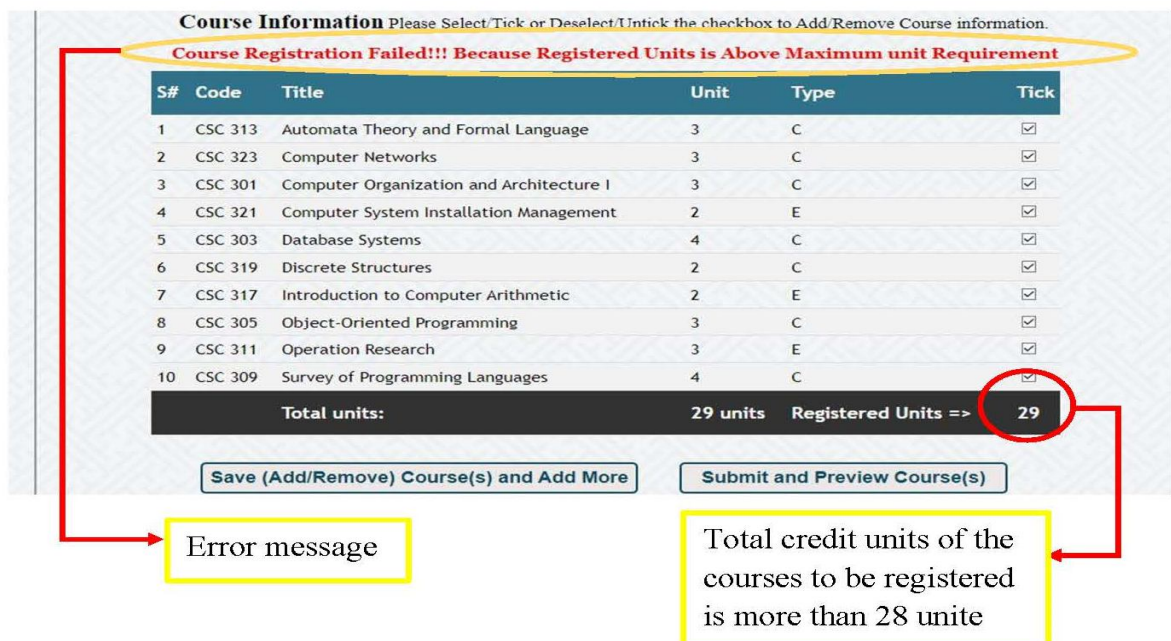


Figure 8: Interface Indicating Total Credit Units is Above Requirement

If a student is having outstanding course(s) from previous sessions but in a corresponding semester, the system will automatically pull the outstanding (carryover or unregistered) courses from the results

portal to the course registration portal and helps the student automatically select the outstanding courses which cannot be unselected by the student as shown in figure 9.

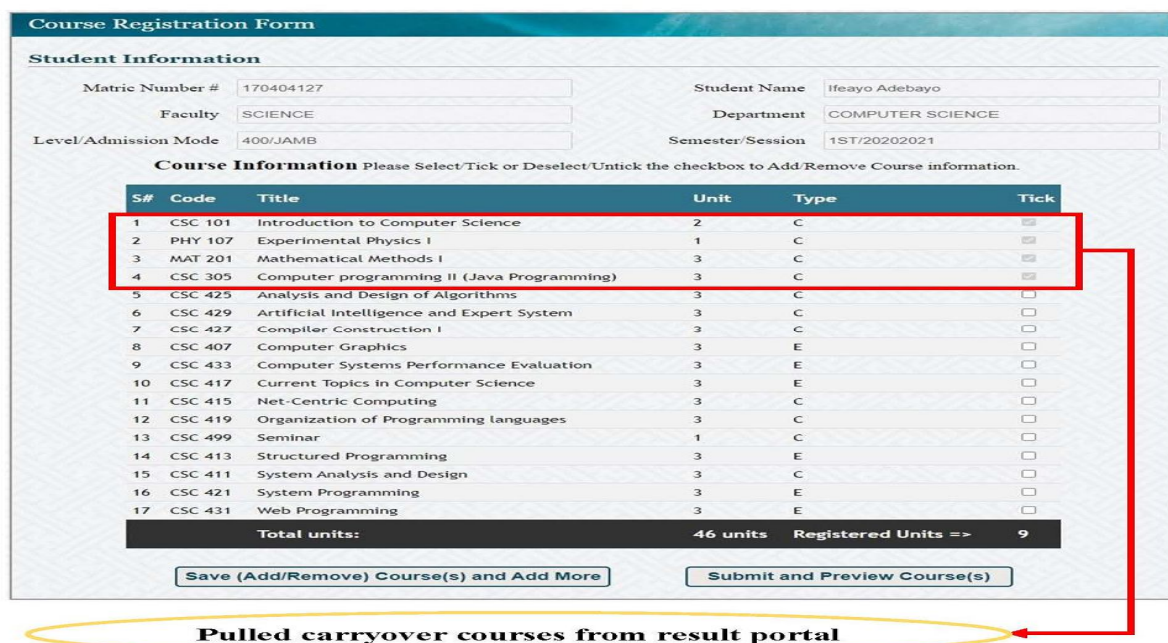


Figure 9: Interface Showing Outstanding Courses Pulled into the Course Registration Page

d. **The Result Portal Module:** This is a module that generates the student's semester result. It combines the indexes keys of the session,

semester and level table in a query and produces the result of the exact semester as shown in figure 10.

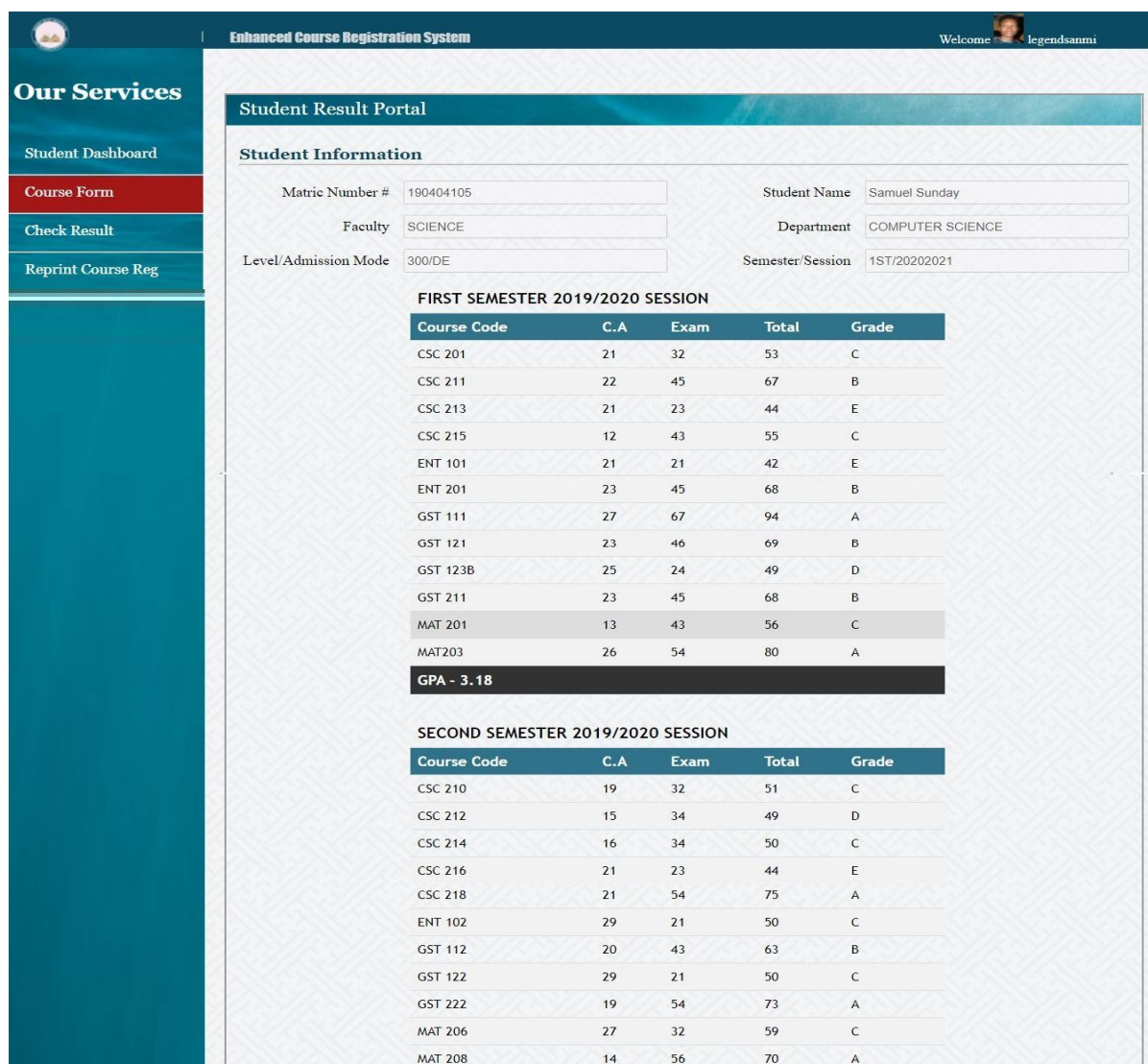


Figure 10: Interface Showing Student’s Result for All Previous Semesters

The Administrator Module

- a. **The Administrator Homepage:** This is an index file of the administrator. It marks the beginning of the administrator’s programming module and establishes a link or connection string that connects to the other module files as shown in figure 11.
- b. **Upload Course Module:** This is the interface for adding courses into the databases. This is where the administrator adds courses into the course form table in the database, where courses are pulled to the course registration portal. The upload course module is shown in shown 12,
- c. **The Course Deletion Module:** This is the module that allows the administrator to delete any outdated course(s) or course(s) that is/are being floated by a department in a semester from the course form table in the database.
- d. **The Course Update Module:** This module allows the administrator to update the information of an existing course in the course form table. This information might include the course unit, status and title, provided the course exist already in the database. The course update module is as shown in figure 13.

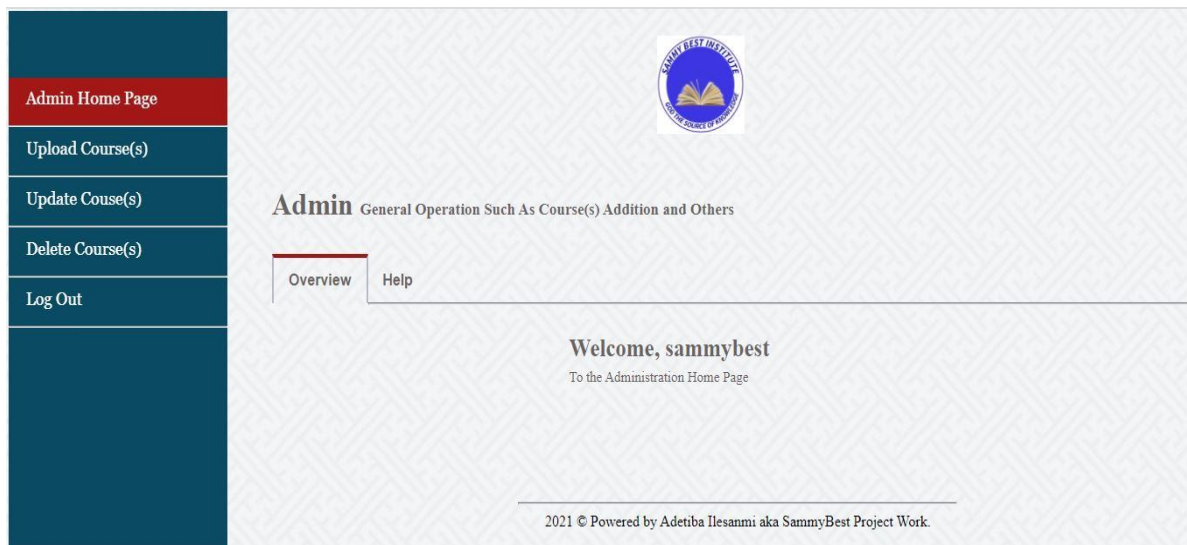


Figure 11: Administrator’s Home Page

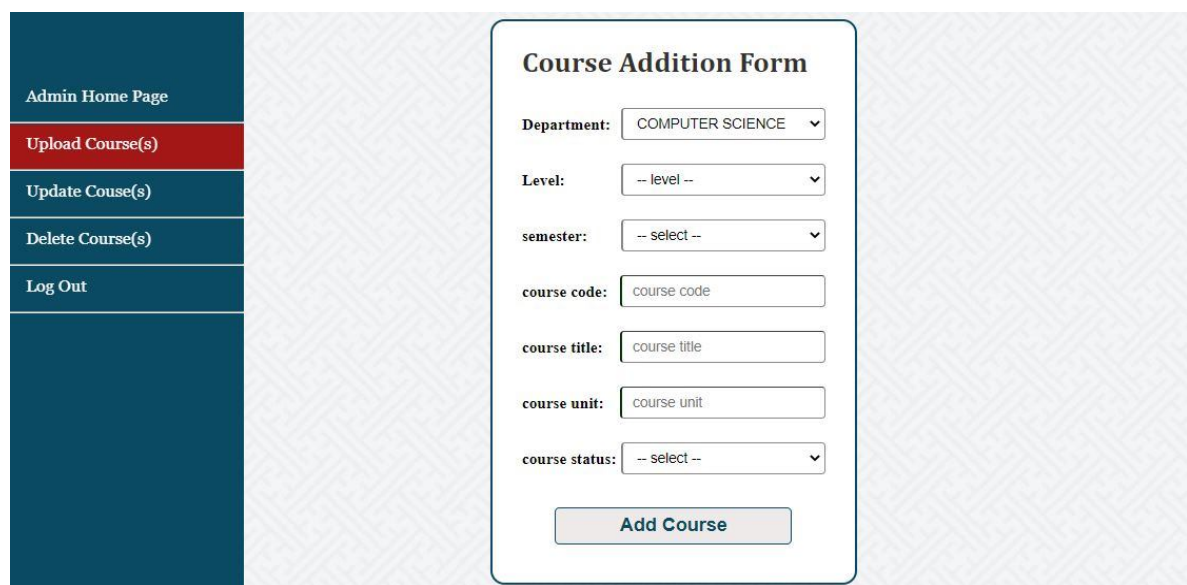


Figure 12: Course Addition Form for Adding Student’s Courses

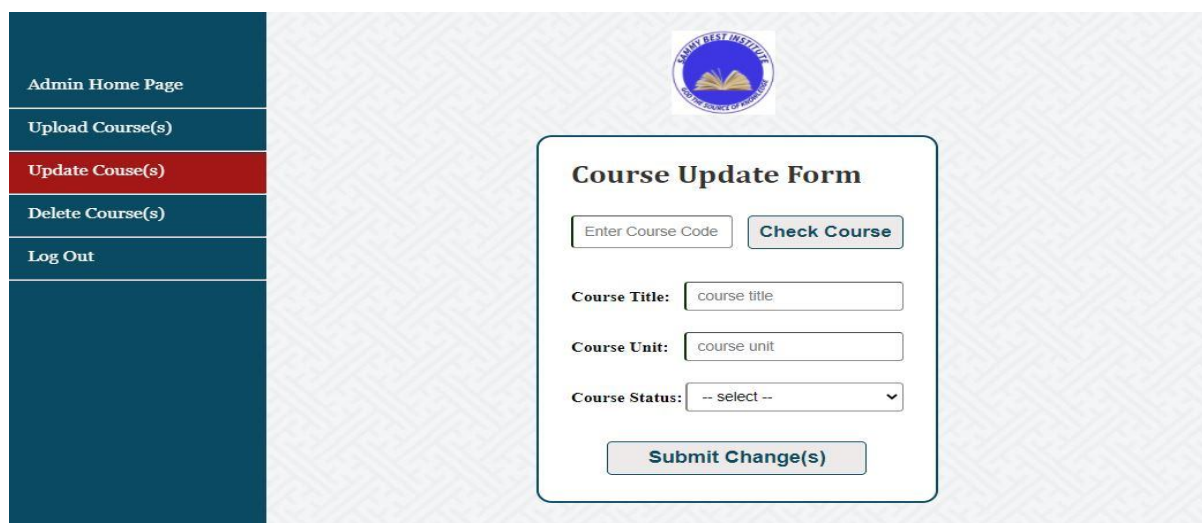


Figure 13: Course Update Form for Updating Existing Course Data

CONCLUSION

The developed student course registration system is an enhanced semi-automated system that is built to remove the major deficiencies and limitations inherent in the current system in place at the Adekunle Ajasin University, Akungba-Akoko of Ondo State, Nigeria. The development of the system became necessary as a result of the growing rates of students' complains as the current system has failed to meet their course registration demands, as well as the problems being encountered by the departments' level coordinators when processing students results.

The developed system is capable of storing and processing students' course registration with high speed and accuracy, and presenting the output in certain required forms. Its qualities include enabling error free registration, reduction in the risk cost on the part of the students resulting from registering incorrect courses or leaving required courses unregistered and time spent in correcting errors encountered while using the current system. The aim of the system is well accomplished in improving the efficiency and effectiveness of the current system.

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