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## A Software Application for Colleges of Education Students Results Processing

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### ABSTRACT

Most educational institutions in Nigeria, such as the Universities, Polytechnics and Colleges of Education still operate on the manual method of record keeping and computation of students' grade point averages (GPA) which is time-consuming and error prone especially when the number of students is large. This paper examines the inadequacies involved in the manual method of calculating Students CGPA (cumulative grade point average) and proposes a solution by developing a software Application to facilitate the automated processing of the results. The software was developed using PHP (Hypertext processor) scripting language and employing MYSQL Relational Database Management System in designing the database. The developed software was tested and found to performed well and produced expected results on completion. With it, it was possible to compute Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) for each student based on examination scores entered. The new system has some qualities such as reduction in the cost of processing of information, reduction in time spent in computing GPA and generating transcripts, increase in accuracy and efficiency, and elimination of duplication of effort which makes it superior to the manual system of student record keeping. This new system is flexible and can be modified to suit any kind of student's record keeping and data processing.

**Keywords:** *Examination Scores, Automated Processing, Cumulative Grade Point Average, Software Application, Results Grading, Database.*

### 1. Introduction

One of the largest investments in many organizations is the creation, maintenance, and retrieval of information. It has been estimated that in an organization such as a tertiary educational community, information is highly essential for correct students' record and examination data. Student information, if not properly created and stored, will cause many errors in usage Okonigene, et al (2008). Nearly every section of the educational system requires information processing. With the use of computers for information processing, the following are possible: instant access to students' personal and course information, instant student information updating, automatic computation of the Grade Point Average (GPA), generation of the graduating students list, monitoring of failed courses, keeping an up-to-date record of the entire student body in the institution, storing course information such as course code, course description, course unit, and scores for the purpose of GPA computation, and producing user-friendly data entry screens for ease of use. It is unfortunate that all educational institutions in the developing world, such as the Universities, Colleges of Education and polytechnics in Nigeria, still operate under the manual method of record keeping and computation of GPA. College of Education Akwanga, Nasarawa State, Nigeria, for example, still operates on this manual method which is highly prone to errors.

College of Education Akwanga was established by the statutes of the Nasarawa State House of Assembly as contained in the extra ordinary Gazette 1 October 1996. At its inception, the College operated with five schools namely; school of sciences, school of art and social sciences, school of Languages, school of Vocational and technical Education and school of Education. All of which having students enrollment increasing every year, right from the inception of this great institution, students result has been manually processed. The manual system employed is not very efficient, in that a lot of paper work has to be done which takes a reasonable length of time to prepare. Due to the increasing number of students in each school of the institution, computation of the student's CGPA has been a very difficult task. Therefore, because of this problems and errors arising from such a system, a software-computerized result processing system becomes inevitable; the benefits accruable from the computer-based system cannot be over emphasized.

#### 1.1 Background

At present the students grading system used by all colleges of education in Nigeria is the Five-Point Grading System, established by the Nigerian commission for colleges of education (NCCE) in 1989. The NCCE five-point grading system is shown in Table 1 below.

The courses offered in a NCE programme are allocated a number of credit hours which vary from one course to another, because the courses vary in their needs and scope. Hence some are allocated greater credit hours than others. The measure of performance of a student in any course is given by the grade-points obtained in that course. The grade-points (GP) obtained by a student in any course are determined by multiplying the value of the grade (numeric grade) by the credit hours of the course. The total grade-points are obtained by summing up the grade-points of all the courses offered. The Grade-Point Average (GPA) is computed by dividing total grade-points by the sum of credit hours of all the courses offered in that period. Thus;

$$\text{GPA} = \frac{\text{Total Grade-Points of the courses offered in the year}}{\text{Summation of the credit hours of the courses in that year}}$$

If a student obtains the grades as shown at the end of, say, Year One, then the GPA is manually computed as illustrated in figure 2. The Cumulative Grade-Point Average (CGPA) in any year is obtained by dividing the cumulative sum of the total grade-points over the years by the cumulative sum of the credit hours over the same period. Thus,

$$\text{CGPA} = \frac{\text{Cumulative sum of Total Grade-Points of the courses from Year One to the Present Year}}{\text{Cumulative sum of the Credit Hours of the courses from Year One to the Present Year}}$$

The CGPA is a very important measure, as this is what determines whether a student can move on to the next level or be made to repeat a year or even withdraw totally from the programme. The final CGPA determines the NCE Certificate awarded to the candidate on eventual completion of the programme. Obviously, for the first year, the CGPA is equal to the GPA.

Manually calculating and tracking CGPA for each student is rather laborious, especially with increasing number of students, and is prone to error. With a computer the task becomes much easier, faster, and more accurate. All that is needed is a suitable software application to run on the hardware, and a solution is established. With the appropriate software in place, the system would simply capture raw scores as entered by individual lecturers for various students in the different courses, and then process accordingly.

## 1.2 Literature Review

The introduction of computer into information technology has massively improved the information need of organization; the success of this machine is dependent on the knowledge base. Therefore, one can be prompted to ask aloud "what is a computer". Anigbogu (2000) defined a computer as an electronic device capable of accepting data and instructions, processing the data based on the instructions to generate results or output in such a manner that is yet to be equaled by any other known machine to mankind.

For the fact that we are already into a new millennium, no organization, company or institution can do without information processing system or organizational information system. So many authors and researchers have in one way or the other taken step towards analyzing the problems associated with manual result processing and the need for computerized result processing.

### 1.3 The setbacks of manual results processing and the need for automated system.

Ukem et al, (2012.) state that the errors associated with the existing manual method of processing of students results in most universities in Nigeria, make it not only desirable but imperative that computerized approach be used in measuring students' progress. According to him, the manual methods being employed suffer a number of setbacks; they make the process to be time consuming and prone to error. They lead to examination results being published late, sometimes with wrong grades being entered and students' grade point averages being wrongly computed as a result, and ultimately leading to wrong conclusions being arrived at the class of degree awarded. Some students could end up with undeserved good class of degree, while others could be unfairly victimized, bringing about frustration and bad blood. The Departments concerned, and the whole University, could become tarnished. He said

the solution to the problem, therefore, is to find a method of processing examination results that would be sufficiently accurate and reasonably timely.

Eludire, (20011). Observed that a number of problems associated with student academic record management include improper course registration, late release of students' results, inaccuracy due to manual and tedious calculation and retrieval difficulties/inefficiency, According to him, the development of database concept is the answer to these problems where the amount of redundant data is reduced and the possibility that data contained on a file might be inaccurate because they were never updated.

Mohini and Amar, (2011) indicated that Publication of students results in the manual system takes a very long time owing to which students remain idle for months together. Sometimes the delay in declaration of result cause heavy losses to the students as generally they cannot join further studies or appear in competitive exams or join jobs because of the non-availability of examination result in time.

Okonigene, et al (2008) observed that, with the use of computers for information processing, the following are possible: instant access to students' personal and course information, instant student information updating, automatic computation of the Grade Point Average (GPA), generation of the graduating students list, monitoring of failed courses, keeping an up-to-date record of the entire student body in the University, storing course information such as course code, course description, course unit, and scores for the purpose of GPA computation, and producing user-friendly data entry screens for ease of use.

#### **1.4 Packages used for Designing of Results Processing**

Different Programming Language, Programming Packages and Database management system can be use to develop result processing software for computing students GPA (Grade Point Average) and CGPA (Cumulative Grade Point Average).

Microsoft Excel spreadsheet program can be used to build an Intelligent Knowledge-Based System (IKBS), making use of various programming facilities provided by that application (Excel). The programming is hard coded into the cells, and cell referencing which could be applied to monitor and track students' performance such as cumulative points (Ekpenyong, 2008).

Personal Home Page Pre-Processor (PHP) is used to communicate with and manipulate the database. Adobe Dreamweaver, an Integrated Development Environment, is used to create the Graphic User Interface and to write the codes. MYSQL Server, a Relational Database Management System, is used to create the database tables and data. This application, though tested and found to be working as expected, has however not been put to use widely. (Ukem and Onoyom-Ita, 2011).

Java is a programming language use to build programs that can work on stand-alone computers and on the internet, its primary features are that it is object-oriented and a cross platform language. By cross platform, it means that the programs can run across several platforms such as Microsoft Windows, Apple Macintosh, and Linux. MYSQL, a Relational Database Management System (RDBMS) is used to create database tables and data. MySQL is very fast, reliable, and easy to use, and its connectivity, speed, and security make it highly suited for accessing databases. (Ukem, and Ofoegbu, 2012).

There are undoubtedly several other similar Programming Language and Database management system in existence. Some previous work has actually been carried out using several of such programming languages and packages which prove to be working fine in this area. Three of such are the work by Ukem, and Ofoegbu, Ekpenyong and that by Ukem and Onoyom-Ita.

There is, however, always room for improvement. This new application is intended to have reduced complexity and greater ease of use, in order to enhance maintainability while still retaining good speed and accuracy.

#### **2. Materials and Methods**

The computer software application is required to be independent of any platform. It is desired to have three main sections, namely: the login window, the main menu and sub menu. The login window requests a valid user name and password from the Administrator to be able to gain access into the software.

The Administrator is any staff that is authorize by the management of the school to be in charge of exams and records unit, hence he should have a valid user name and password created by him to be able to login to the software. The Administrator should be able to perform the following function:

- Create user account for Lecturers (academic staffs), Departmental Exams officers and Head of Departments.

The Head of Departments must have a valid user name and password to perform the following function:

- Register students in His Department

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- Register staff in the Department
  - Register courses offered in the Department
  - Assign courses to registered staff in the Department
  - Assign examination officers to Different levels ( i.e NCE 1,2 or 3).

The Departmental Exams Officer of each level should have the authentication of the Administrator. He/she needs to be a registered Staff, and thus have a valid username and a password. He should be able to perform the following functions:

- Enter student's scores and view students' grades as it is in the raw score sheet.
- Process students results in the department, which includes calculating the GPA and CGPA
- View all the students' results in management approved format (Agreed marked sheet)

The Lecturer (Academic staff) should have the authentication of the Departmental Exams officer. Hence, he should be registered by the Administrator, should have a valid username and password. He should be able to perform the following functions:

- Enter students' scores for courses he/she thought.
- View the grades he entered.

These details enumerated above, along with other details of the application, are shown in the architectural design of the application which is illustrated in Fig.1.

The Application was implemented using Personal Home Page Pre-Processor (PHP) also known as Hypertext Preprocessor, a Scripting language. Hypertext Preprocessor (PHP) is a server-side, cross-platform, HTML-embedded scripting language originally designed for [Web development](#) to produce [dynamic Web pages](#). Its primary features are that , PHP can be deployed on most Web servers and also as a standalone [shell](#) on almost every [operating system](#) and [platform](#) such as Microsoft Windows, Apple Macintosh, Linux, and so on free of charge. PHP is not only used on almost every [operating system](#) and [platform](#) but also PHP eliminates the need for numerous small programs by allowing you to place simple scripts directly in your HTML files. It also makes it easier to manage large web sites by placing all components of a web page in a single html file. Hence the researcher finds PHP suitable for the design of the application to make it web-enabled. The new system was also implemented in the form of a database using the Waterfall software life-cycle model, considering the fact that various types of data would need to be held, and a database approach would be more appropriate due to the advantages that the database file system has over other forms of file systems. Adobe Dreamweaver an Integrated Development Environment, is used to create the Graphic User Interface and to write the codes, while MYSQL (My Structured Query Language), a Relational Database Management System (RDBMS) is used to create the database tables and data. The flow of the program logic is shown in Fig.2.

The system is designed and implemented such that the following are carried out during its use:

**User validation:** To be able to use the software, staffs are to be registered by the Administrator with a default username and password on the first login to the software.

**Students Registration:** Students in the Department are to be registered on the system.

**Course Registration:** Courses offered from first year through final year should be registered in every department.

**Usage:** At the end of the period (semester or session) staff will login to the software and enter students' marks from the score sheet (agreed marked sheet) for any course they are assigned. Staff can also view results already submitted, if they want, or change their password when desired, while Departmental Exams officers will have the authentication to process students' results (i.e. calculate GPAs and CGPAs) for their respective units for any academic session they choose. The Departmental Exams officers can also view any student's GPA and CGPA in his unit. Finally, the HOD can view all staff, students and course registration, as well as be able to view any student's result irrespective of the student's unit in the department.

### 3. Results and Discussions

The developed software application was run on the system and found to operate as expected. The login screen is as shown in Fig. 3. Once the user is able to log in, the main window appears.

If the password entered is valid, the software will then open the main page, once the user is able to log in; the main window/page appears. The main page/window has two menus; the main menu, and the side menu. The main menu contain the following commands; the Admin, Registration, Computation, Transcript, site administrator (login user) and log out as shown in Figure 4.

Within the Registration, Computation and Administration commands, there are sub-menus that appear once they are clicked. For example, when Result Computation is clicked, sub-menus such as “Agreed Marked Sheet (Score sheet)”, “View Agreed marked sheet (Result)”, “Summary Sheet (Process Result)”, “CGPAs”, and “Carry Over” will appear as shown in Figure 5.

When Administration is clicked, the sub-menus “Change Account”, “Add/Delete Staff”, and “Assign Courses”, appear. Once any submenu is clicked, a frame appears at the Panel, where the main action is performed. A sample screen, of the Students Registration Window is as shown in, Figure 6 below which shows a frame where student registration takes place.

Similar windows exist for Score Sheet (Agreed marked sheet) for capturing students raw scores which is available to course lectures only, and Summary Sheet (GPAs and CGPAs) window for computation of students GPA and CGPA are shown in Figure 7 and Figure 8.

Drop down menus are provided to allow for easy selection of items in some cases (Figure 6 ), while in others, radio buttons are used. Also available are some text fields, these do not have drop down menus and desired text needs to be typed in as shown in (Figure 6 ). The outputs from the system are various; they include a listing of registered staff, registered courses, and registered students. Processed results can be viewed for one student at a time as seen in Figure 9; it shows the GPA, for a semester and since this is the first year, there is no CGPA as such.

The application provides a simple and convenient approach to the processing of students’ results, including GPAs and CGPAs. It is reasonably secure because, due to password protection, no unauthorized person can gain access to alter the data. The information obtained from the system has a reasonably high degree of accuracy, because all the computations are automated. Any errors found would probably be those introduced by human error in the keying in of the raw scores. Computations are carried out very speedily by the system, once all raw data has been entered, and then required information is available almost immediately.

#### **4. Conclusion and Recommendations**

##### **4.1 Conclusion**

In order to introduce the use of computers into the manual processing of students’ information, careful investigation and analyses were carried out on the existing method. Many text and journal (handbook) records were consulted to have an in-depth and thorough understanding of the major concepts of operations. This work finally presented a software application meant to ease the processing of students results in College of Education, Akwanga, Nasarawa State. The application was successfully developed, tested, and found to be working as expected. After the trend of investigation and initial analysis had been made on both the manual system (old) and the new system of carrying out the operation of students result processing, it became obvious that It is capable of storing and processing students’ results with high speed and accuracy, and presenting output in certain required forms. It has some qualities such as reduction in the cost of processing, reduction in time spent in computing GPAs./CGPAs, generating transcript, and elimination of duplication of effort which makes it overshadow the manual system of students record keeping. The Application software is flexible and can be modified to suite any kind of record keeping and data processing. It is easy to use due to the use of a GUI (Graphical user interface) rather than command-line approach, reasonably secure, and enforces data integrity resulting from the use of a relational database management system. With this application, the processing of students’ results can be automated to a large extent, thereby reducing processing time and increasing accuracy.

##### **4.2 Recommendations**

The efficiency of the software can be further enhanced based on the following recommendations: Effort should be made to validate the input data to ensure the integrity of the system. The primary users should be given an initial orientation on how to interact with the system for optimal utilization of the facilities of the system. Though the application is web-enabled, which makes it easier for Users to access the application from anywhere via the Internet, and be able to carry out their work, and students with proper authorization would be able to view their results on-line, the relevant authority should register with Nigeria communication commission for license so that students can access results on their mobile phones. The issue of security could also be looked into, with a view to improving it so that users would have greater peace of mind, knowing that their data would not easily be compromised.

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Table 1: The NCCE Five-Point Grading System

SCORE (%)	LETTER GRADE	GRADE VALUE	REMARK
70-100	A	5	Excellent
60-69	B	4	Very Good
50-59	C	3	Good
45-49	D	2	Average
40-44	E	1	Pass
00-39	F	0	Fail

Table 2: Illustration of how a student's GPA may be calculated manually

Course Code	Credit Hours	Scores	Grade	Grade-Points (GP)
CSC 111	2	45	D	2 X 2 = 4
CSC 112	3	54	C	3 X 3 = 9
CSC 113	2	34	F	0 X 2 = 0
CSC 114	1	65	B	4 X 1 = 4
ECO 111	3	45	E	1 X 3 = 3
ECO 112	2	65	B	4 X 2 = 8
ECO 113	3	44	E	1 X 3 = 3
ECO 114	2	45	D	2 X 2 = 4
GSE 111	2	56	C	3 X 2 = 6
GSE 112	2	45	D	2 X 2 = 4
GSE 113	3	56	C	3 X 3 = 9
EDU 111	1	45	D	2 X 1 = 2
EDU 112	3	76	A	5 X 3 = 15
EDU 113	3	56	C	3 X 3 = 9
CSC 121	3	66	B	4 X 3 = 12
CSC 122	3	63	B	4 X 3 = 12
CSC 123	2	62	B	4 X 2 = 8
ECO 121	2	51	C	3 X 2 = 6
ECO 122	2	63	B	4 X 2 = 8
ECO 123	1	55	C	3 X 1 = 3
GSE 121	1	53	C	3 X 1 = 3
GSE 122	2	44	E	1 X 2 = 2
GSE 123	3	45	D	2 X 3 = 6
EDU 121	2	64	B	4 X 2 = 8
EDU 122	2	55	C	3 X 2 = 6
EDU 123	2	64	B	4 X 2 = 8
	<b>57</b>			<b>162</b>

Total Grade-Points = 162

Total Credit Hours = 57

Grade Point Average (GPA) =  $162/57 = 2.84$

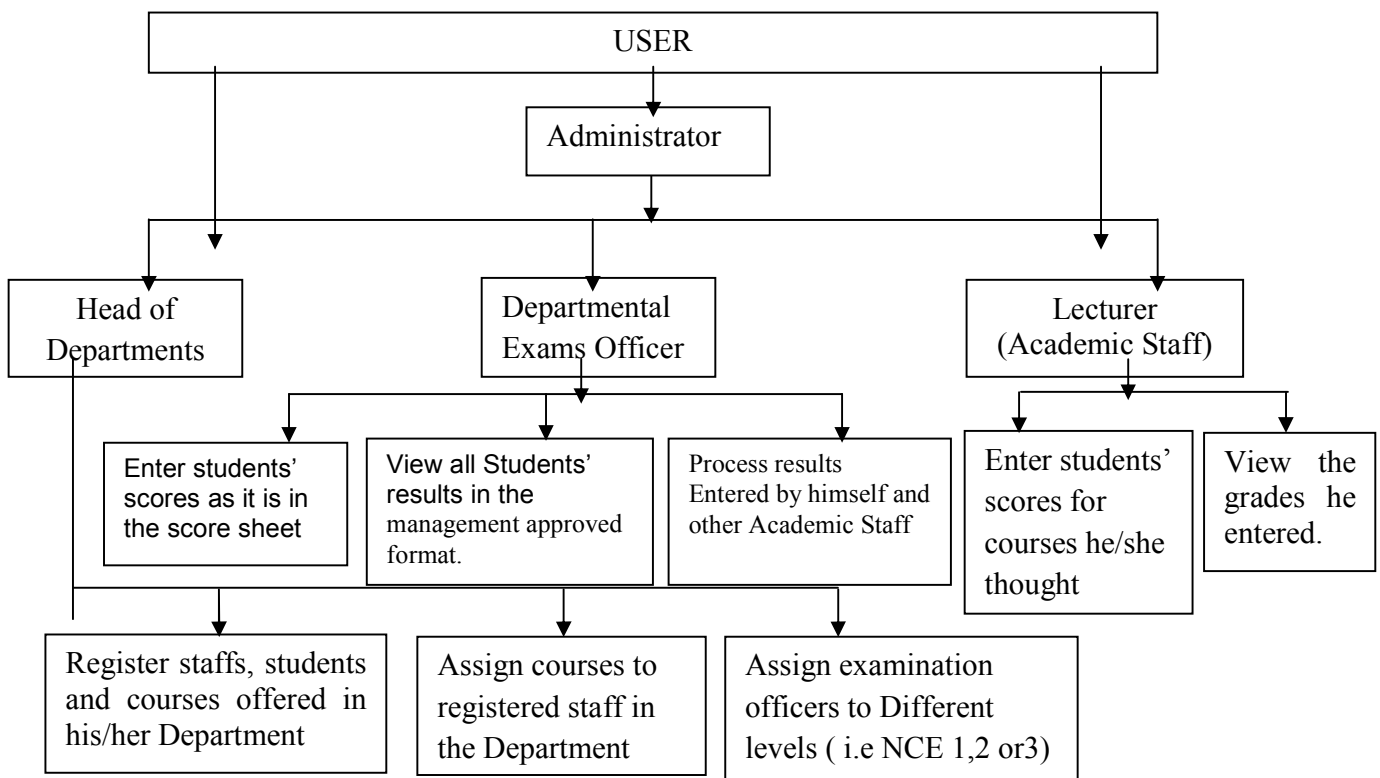


Fig. 1: The Architectural Design of the Software Application



The program flow Chart

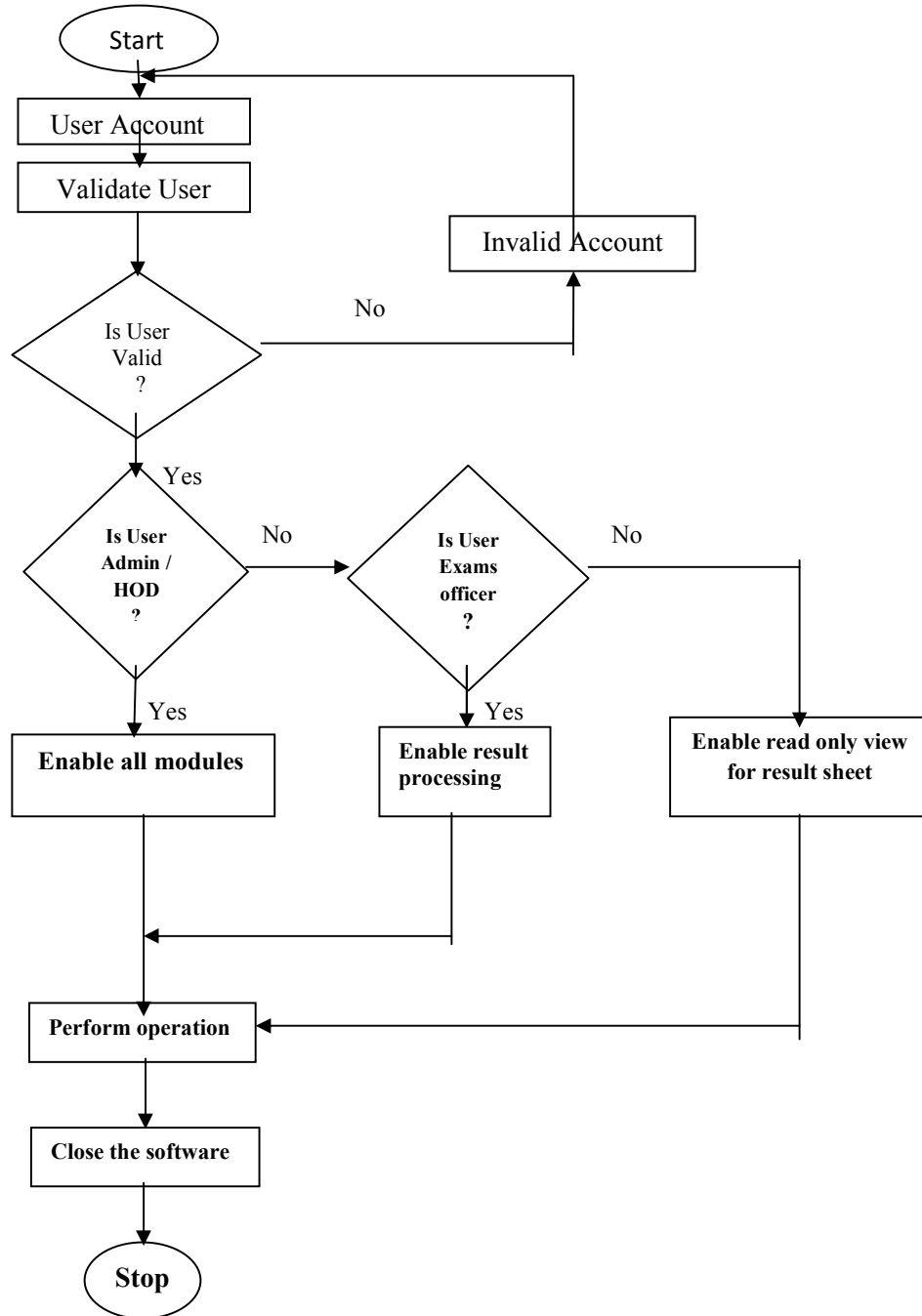


Fig.2: The program's flow chart

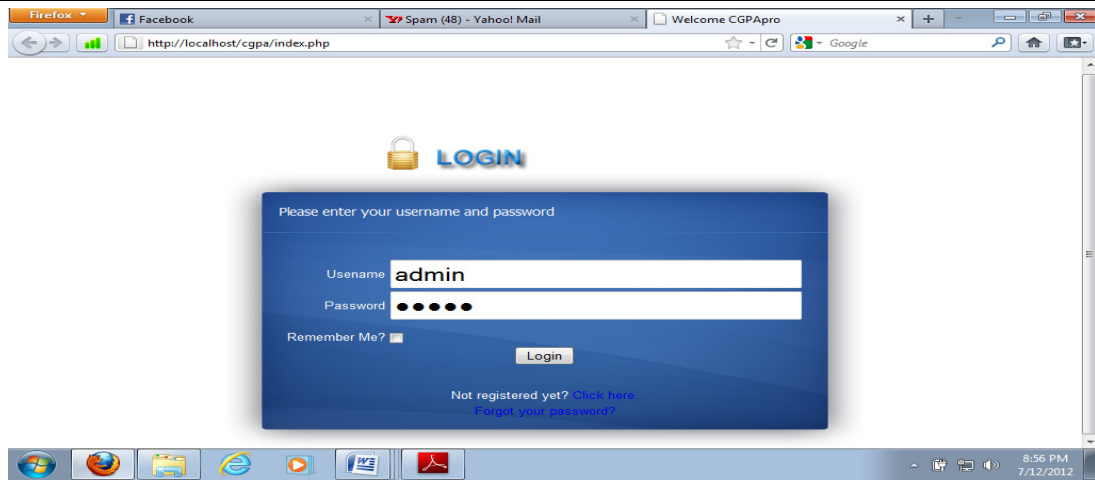


Fig. 3: Log in Page (Validates user account before access is granted)

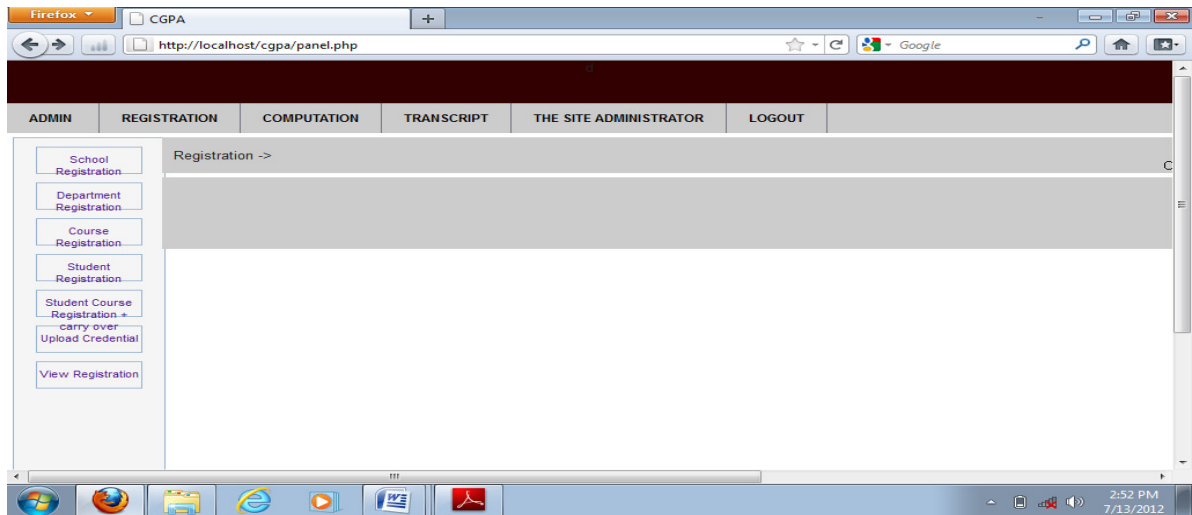


Figure 4: The Main Page/window showing the main menu and the side menu

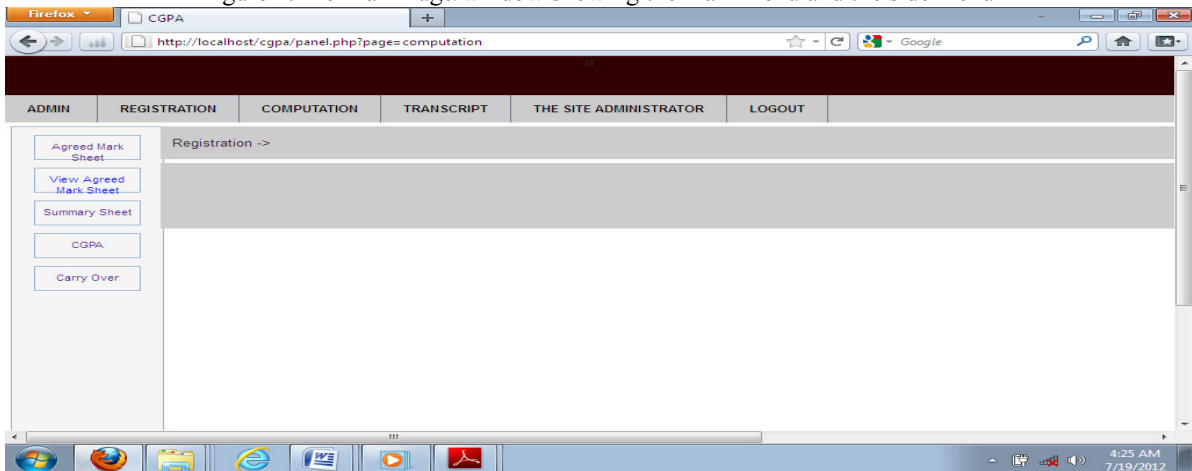


Figure 5: sub-menus of the main menu (computation)

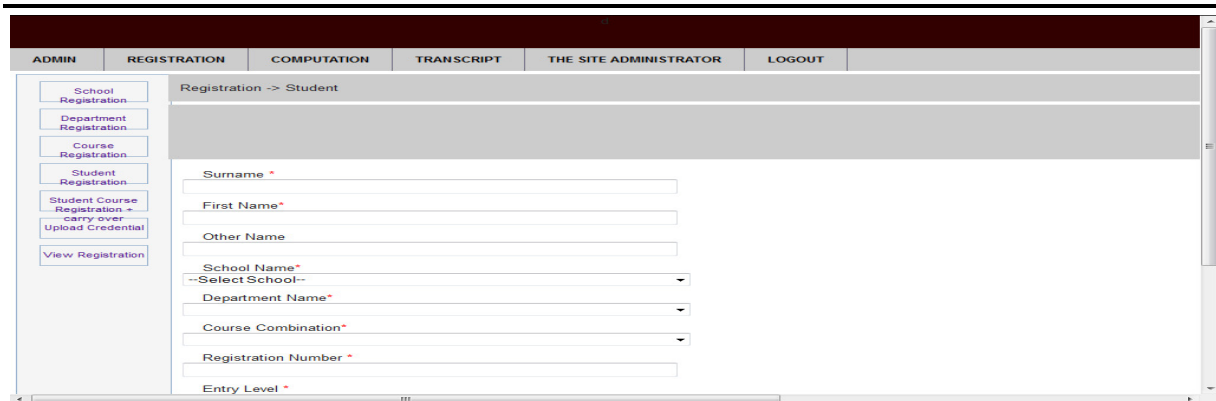
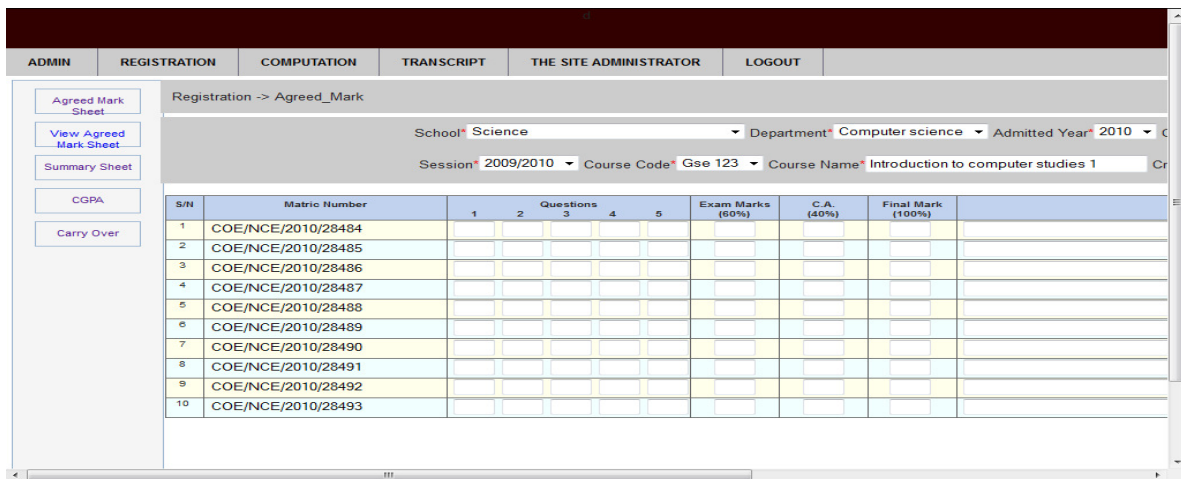
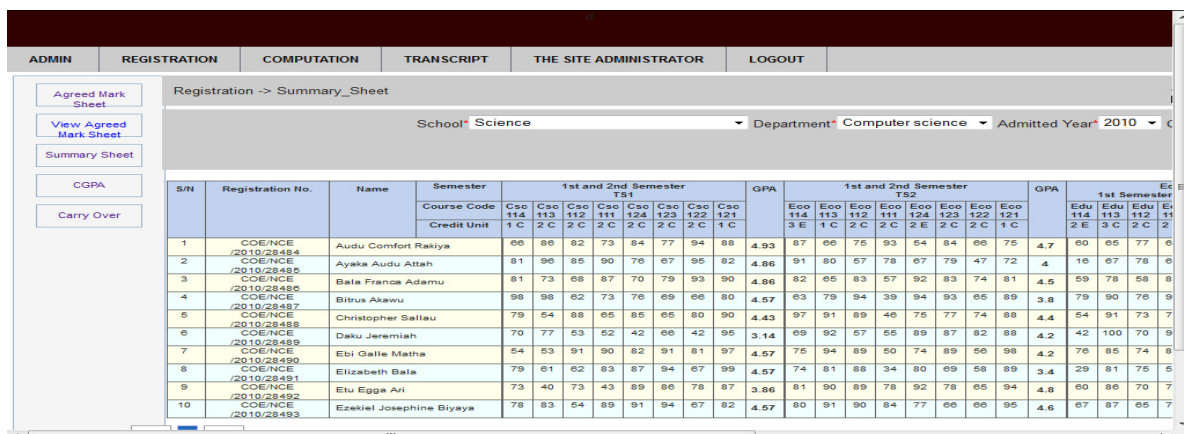


Figure 6: Students Registration Window (For registering all students in the Department)



S/N	Matric Number	1	2	3	4	5	Exam Marks (60%)	C.A. (40%)	Final Mark (100%)
1	COE/NCE/2010/28484								
2	COE/NCE/2010/28485								
3	COE/NCE/2010/28486								
4	COE/NCE/2010/28487								
5	COE/NCE/2010/28488								
6	COE/NCE/2010/28489								
7	COE/NCE/2010/28490								
8	COE/NCE/2010/28491								
9	COE/NCE/2010/28492								
10	COE/NCE/2010/28493								

Figure 7: Score Sheet (Agreed marked sheet) – for course lectures only



S/N	Registration No.	Name	Semester	Course Code	1st and 2nd Semester TS1								GPA	1st and 2nd Semester TS2								GPA	1st Semester			EC
					Csc		Cso		Csc		Cso			Eco	Eco	Eco	Eco	Eco	Eco	Edu	Edu		Edu			
					1 C	2 C	1 C	2 C	1 C	2 C	1 C	2 C		3 E	1 C	2 C	2 C	2 E	2 C	1 C	2 E		3 C	2 C		
1	COE/NCE/2010/28484	Audu Comfort Rakiya			66	86	82	73	84	77	94	88	4.93	87	66	75	93	54	84	66	75	4.7	60	65	77	6
2	COE/NCE/2010/28485	Ayaka Audu Attah			81	96	85	90	76	67	95	82	4.96	91	80	57	78	67	79	47	72	4	16	67	78	6
3	COE/NCE/2010/28486	Bala Franca Adamu			81	73	68	87	70	79	93	90	4.86	82	65	83	57	92	83	74	81	4.5	59	78	58	8
4	COE/NCE/2010/28487	Bitrus Akawu			98	98	62	73	76	69	66	80	4.57	63	79	94	39	94	93	65	89	3.8	79	90	76	9
5	COE/NCE/2010/28488	Christopher Sallau			79	54	88	65	85	65	80	90	4.43	97	91	89	46	75	77	74	88	4.4	54	91	73	7
6	COE/NCE/2010/28489	Daku Jeremiah			70	77	53	52	42	66	42	95	3.14	69	92	57	55	89	87	82	88	4.2	42	100	70	9
7	COE/NCE/2010/28490	Ebi Galle Matha			54	53	91	90	82	91	81	97	4.57	75	94	89	50	74	89	56	98	4.2	76	85	74	8
8	COE/NCE/2010/28491	Elizabeth Bala			79	61	62	83	87	94	67	99	4.57	74	81	88	34	80	69	58	89	3.4	29	81	75	5
9	COE/NCE/2010/28492	Etu Egga Ari			73	40	73	43	89	66	78	87	3.86	81	90	89	78	92	78	65	94	4.8	60	86	70	7
10	COE/NCE/2010/28493	Ezekiel Josephine Biyaya			78	83	64	89	91	94	67	82	4.57	80	91	90	84	77	66	66	95	4.6	67	87	65	7

Figure 8(screen 1):Summary Sheet / GPA and CGPA window (For Exam Officers only)

ADMIN																							
REGISTRATION			COMPUTATION			TRANSCRIPT			THE SITE ADMINISTRATOR			LOGOUT											
Registration -> Summary_Sheet																							
School: Art and Social Science Department: Economics Admitted Year: 2012 Current																							
<input type="button" value="Agreed Mark Sheet"/> <input type="button" value="View Agreed Mark Sheet"/> <input type="button" value="Summary Sheet"/> <input type="button" value="CGPA"/> <input type="button" value="Carry Over"/>	S/N	Registration No.	Name	Semester	1st and 2nd Semester TS1								GPA	1st and 2nd Semester TS2				GPA	1st Semester				
					Course Code	Eco 124	Eco 123	Eco 122	Eco 121	Eco 114	Eco 113	Eco 112	Eco 111							Edu 124	Edu 123	Edu 112	Edu 111
					Credit Unit	2 E	2 C	2 C	1 C	3 E	1 C	2 C	2 C							1 C	2 E	2 C	2 C
	1	CO/ENCE /2012/26287	James Emmanuel Danbaba		43	34	58	42	47	40	56	38	1.4	Warning: Division by zero in C:\xampp				0	67	66	65	7	
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Figure 9: Processed Results viewed for a Single Student.

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