

Design and Implementation of a Centralized University Result Processing and Transcript System: Case study of University of Ibadan

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Date received: December 10, 2018

Date received in revised form: January 7, 2018

Date accepted: January 26, 2018

Recommended citation:

Osunade, O., Ayinla, I. B., & Aduroja, O. O. (2018). Design and Implementation of a centralized university result processing and transcript system: Case study of University of Ibadan. *International Journal of Computing Sciences Research*, 2(3), 89-101. doi: 10.25147/ijcsr.2017.001.1.27

Abstract

Purpose – Result processing and Transcript generation are academic and administrative tasks which universities are engaged in on a regular basis. Results inform students of their academic progress while transcript is a record of a student's academic performance. In most tertiary institutions the two tasks are handled separately with manual operations linking the two tasks. The manual operations and interconnections lead to errors in calculations and delay the production of results or transcript. The delay has caused many students or graduates to lose opportunities.

Method – In this work, a combined and centralized result processing and transcript generation system was developed for a tertiary institution. The implementation was done using a Faculty as pilot study before extending to other faculties.



Findings – The output shows the results were calculated correctly, graduation parameters applied correctly and reports such as transcript easily generated from the web-based application.

Conclusions – The developed transcript and result processing system is functional and operational at the University of Ibadan. It has been used for over 4 academic sessions. The system is compatible with all Nigeria Universities Commission (NUC) regulations. The cooperative result processing technique that ensures results are provided for all registered students and documented permission for result changes are some of the features that users have appreciated.

Recommendations – Tertiary institutions in Nigeria are encouraged to customize the developed system to eliminate repetition. Additional security mechanisms such as biometrics may be added as another layer. The system may be hosted in the cloud if there is adequate technical support.

Practical Implications – This implies that student academic records are stored digitally and requests for reports such as transcripts and statement of results are efficiently produced. The need for result requests for individual student is over as all results for registered students must be submitted for computation as at when due. Manipulation of results is eliminated due to the multi-layered security built into the operation of the system.

Keywords: automated processing, report generation, database, web-based, grading system

INTRODUCTION

The result-processing and transcript generation are two tasks within tertiary institutions that link the academic section with the administrative section. The academic section examines the students, grade the examinations and award scores for each course taught in the semester. The Department approves the scores at a meeting and directs the examination officer to process the overall performance of students in the department for that session and to distribute the scores to departments who have students with scores in a course taught in that department. Examination officers have a variety of options (e.g., calculators, excel sheets, bespoke programs) to use in processing or calculating the overall performance of each student in the department. The processed results of each level of study from the Departments are presented to the Faculty Board for approval. The Faculty, in conjunction with the Examinations Office, on behalf of the Departments presents the results to Senate for approval. The Senate approval is final. This process is the same for both final year and non-final year students. All other activities such as transcript generation and statement of results occur after senate approval. The University of Ibadan Act (1962) section 5 part 2c empowers Senate as follows “the

organization and control of courses of study at the university and of the examinations held in conjunction with those courses.”

The administrative section involvement in result processing and transcript generation starts from the departmental and faculty level, where the administrative staff assists in preparation for the Faculty Board or Senate meeting. The Examinations Office decides on the format of result presentation at the Faculty and Senate level of the University. After Senate approval of the presented results, the administrative section is in charge of transcript generation and endorsement.

The relationship between the academic and administrative sections has been mutually satisfactory. However, the relationship did not include the student population who are the owners of the processed scores. The forceful entrance of students into the relationship changed the dynamics, responsibilities and deliverables as it relates to academic performance. The bid to integrate and meet the demands of students for timely dissemination of results, reduce the transcript generation time for graduates, improve retrieval of results from departmental archives and the need to reduce result computation period led to this work. The aim of this work is to develop an automated and secured result processing system that generates appropriate reports such as transcripts and statements of results. The grading system at University of Ibadan is based on the seven-point system (Faculty of Science Prospectus, 2013) as opposed to the four-point system currently proposed by the National Universities Commission (NUC).

LITERATURE REVIEW

Ukem and Ofoegbu (2012) developed a computer software application to facilitate the automated processing of undergraduate results to eliminate tedious and error prone processes. The software was developed in Java programming language and PHP while employing MYSQL Relational Database Management System. The developed software works based on the five point system of the National Universities Commission (NUC) with user access limited to three roles: Super Administrator, Staff Administrator and Staff. The software computed Grade Point Average and Cumulative Grade Point Average for each student based on examination scores entered. The software is secured by only passwords; not web-based thus access is restricted; requires manual entry of scores and does not generate reports. The software focused on results processing at the departmental level only.

In Oyeyinka and Oladipo (2015), the result processing software was re-engineered into a multi-modal system (data access layer, program logic layer and the user interface) comprising of five major modules designed for specific user groups with assign privileges. The system operates in online and offline mode and has ability for forward and backward integration with the student course registration portal. User feedback was accepted to ensure all requirements were met. However, the software relies on manual collation of student’s scores for every course taken before computation.

Akinmosin (2014) developed a single platform to manage the processing of all examination records within Nasarawa State University, Nigeria. The system has two levels of design models: physical and logical. The physical model refers to the interfaces between users, the result system and user devices; while the logical model consists of the database. The data used for testing was obtained from the Department of Physics, Nasarawa State University. The performance evaluation showed that the system is still under development and requires customization to the grading system of the University.

In Cadar, Teytelman and Trusova (2003) a design of a system that replaces paper transcripts with computerized records that are secure, safe, convenient and practically impossible to falsify was presented. The design is based on Authenticated Grade Records (AGRs), which are used to record a grade for a particular subject/course, record the number of classes taken in a particular term and certify that a degree was received. These records are computerized and are digitally signed with private keys, using the RSA algorithm to ensure authenticity. Universities then carry out the verification process using the public keys received either from the sending University or Educational institution. This work is applicable to the output of the result processing and transcript system where a framework of interconnected institutions exist such as that provided by NUC.

Oluwasegun, Akomolafe and Oyedeji (2015) provided a biometric-based solution for the security issues affecting result processing in tertiary institutions in Nigeria. The fingerprint authentication system was developed using VisualBasic.net. Staff fingerprints were enrolled into the system to form a biometric template which the system validates against at every login attempt on the result processing software. The result processing software also ensures that all write transactions to the database are confirmed and identified by forcing another biometric authentication at the point of making a write request to the web server and associated database. This ensures that the exact person initiating the transaction was the same user who logged in to the application. The users identified at login and various confirmation milestones set for write transactions are logged into a table for future reference and audit trail. The security of data into the system is considered by this solution.

Iwuagwu (2013) documented issues students face when requesting for transcripts as evidence of academic performance. Some of the identified issues include misplaced records, dependence on paper records and limited storage for physical files. A computerized information system was proposed and demonstrated. The proposed system is not based on any requirements hence the functionalities are limited.

Ajayi, Lawal and Isheyemi (2015) provided a mobile application for users to request for transcripts from an educational institution. The mobile application was developed to target the android mobile platform with Java Android Programming (Native App) as the language of development. The Hybrid Mobile App with HTML5 and JavaScript was compiled with Phonegap. ObjectOriented PHP served as the frontend with MySQL

database as the backend. This mobile app prevented hacking of transferred data by employing md5 checksum for data encryption.

Ogwuche and Oyerinde (2015) investigated the implementation of information retrieval and indexing in an academic transcript system. The work sought to reduce the time consumed in comparing and finding student records saved in different tables. An algorithm that would optimize data and preserve them in an eco-friendly manner, improving the indexing and retrieval process of the system was implemented and evaluated.

Pandya (2010) designed and implemented a transcript tracking system for transcripts submitted at California State University, United States of America. The system accommodates multiple points of entry and allows staff to efficiently track the acceptance and routing of a transcript. The system interacts with the existing student portal and provides real time status of the processing of the transcript turned in and additional reports needed for audit processes.

From the related works reviewed, it will be seen that academic institutions have challenges handling result processing and transcript systems. The solutions proposed, designed and implemented have ranged from academic perspectives to mobile users and security. In this work the aim is to implement a secured result processing and transcript system.

METHODOLOGY

This work was done using the experimental approach. The proposed Result Processing and Transcript System consist of four modules. The modules interact and are integrated to meet the requirements specified in the Faculty Handbook/Prospectus and the Student Information Handbook. The Software Development Life Cycle was adopted for the development of the Result Processing and Transcript System. The modules for the result processing and transcript system are shown in Figure 1.

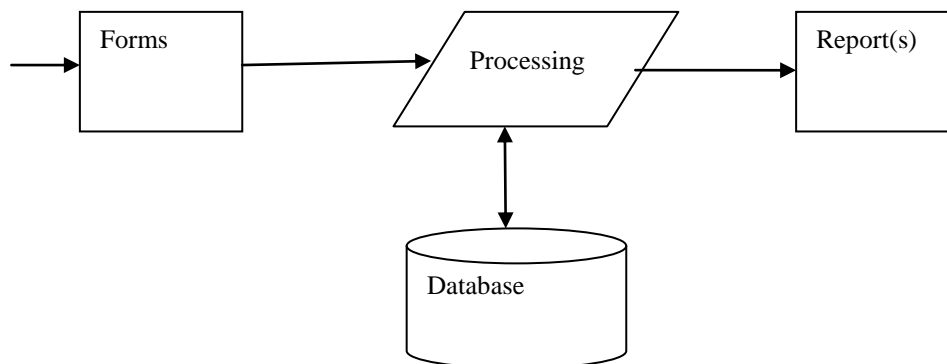


Figure 1. Model of Result Processing and Transcript System

The Result Processing and Transcript System uses forms, databases, algorithms and reports to meet all the requirements and functionalities desired by students, staff and external agencies such as World Educational Services (WES). Figure 2 shows the functionalities available on the Result Processing and Transcript System.

The forms serve as input to the system with some of the following data fields available scores for a course; student identification number for a course taught and examination administered; session, course code, department, faculty and report type. The database stores student bio-data, course details such as code, title, number of units, scores, computed results, staff names and position. The processing module consists of algorithms for computation and report generation using the rules and regulations from the handbook. Sub modules exist for final year students and non-final year students. The reports serve as output from the system allowing such functions as view, print, send by email and send by SMS.

Table 1: Functions available on Result Processing and Transcript System

Data Capture	Data Update	Reports	Administrator
Student/Staff Data	Edit Result	Senate format	User
Course	<ul style="list-style-type: none"> • Student 	Faculty Board	Management
Registration/Session	<ul style="list-style-type: none"> • Course 	format	Maintenance
Score sheet Upload	Delete Result	Departmental	Course Info
	<ul style="list-style-type: none"> • Student 	format	Programme
	<ul style="list-style-type: none"> • Course 	Statement of	Information
	Edit Bio-data	Result	Faculty Info
	Edit Course	Transcript	Department
	registration	Registration	Information
	<ul style="list-style-type: none"> • Add/Delete form 	data	
		Results per	
		course	
		Performance	
		Analysis	
		Warning List	

The system is web-based, using PHP for the programming and MySQL for the database, and accessible only via local network connection with computer MAC address authentication.

RESULTS

The program was used by most departments in Faculty of Science for the 2013/2014 session as a pilot study. The Faculties of Law, Arts and The Social Sciences are currently using the system. To implement the result-processing program, a server to host the program and student data and results was provided. All users (Lecturers, Examine Officers, Head of Departments, Deans and Record Officers) in the University will access

records from the same domain thereby eliminating problems of redundancy and inconsistency in records. The result calculation process for each department was confirmed by the Head of Department, because the program uses content from the Faculty Handbooks. The student data (bio-data and course registration) was collected from the student portal while the department provides the approved scores for each course taught. The program calculates the results and produces outputs based on several formats e.g. faculty, senate, etc.

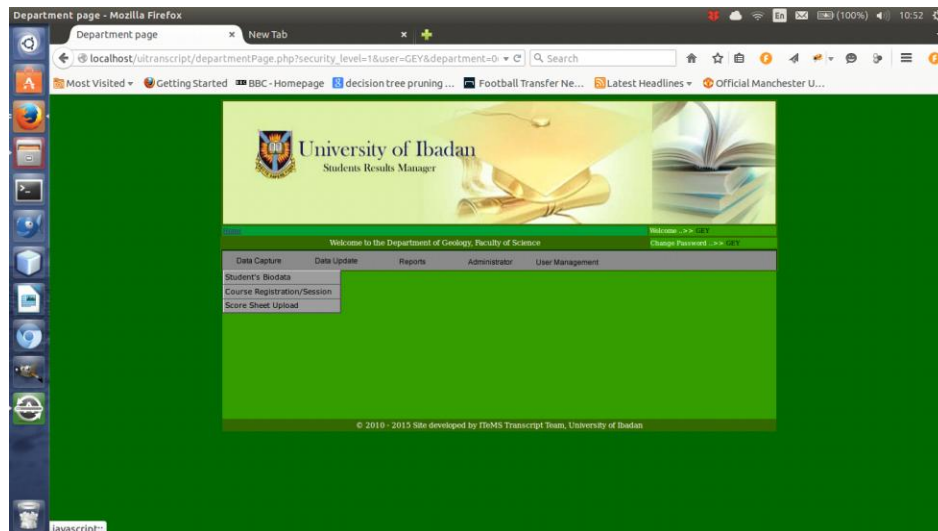


Figure 2. Services Available

Users login to the application through a unified interface. Authentication was done via system MAC address and login details specific to a department for the purpose of security. When authenticated, users are granted access to different services provided by the system as shown in Fig 2. The services available include data upload, reports and so on.

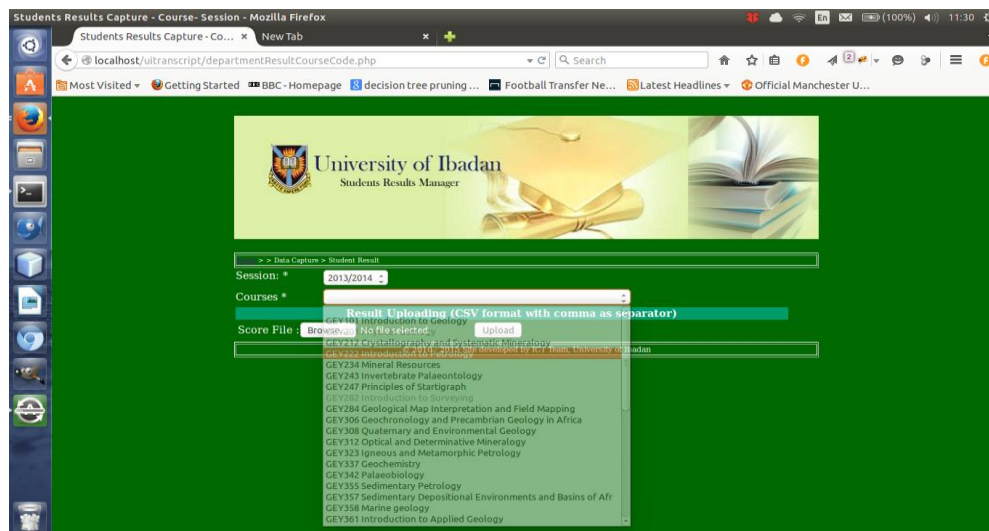


Figure 3. Data Upload interface

Users can only upload results for the courses taught in their department. The session and course are selected on the interface, while results are uploaded in .csv format as in Figure 3. The .csv file has 2 columns for matriculation number and score.

UNIVERSITY OF IBADAN
FACULTY OF SCIENCE
DEPARTMENT OF GEOLOGY
DEGREE EXAMINATIONS

Course Code : GEY234 Course Title : Mineral Resources
Session: 2013/2014 Semester: First : Date 15-06-02 12:54:56

S/n	Matric No	Department	Score	Status	Remarks
1	170708	Geology	63	Success	
2	170724	Geology	65	Success	
3	170725	Geology	55	Success	
4	170728	Geology	68	Success	
5	170730	Geology	63	Success	
6	170731	Geology	68	Success	
7	170733	Geology	50	Success	
8	170735	Geology	61	Success	
9	170736	Geology	55	Success	
10	170738	Geology	68	Success	
11	170739	Geology	60	Success	
12	170740	Geology	64	Success	
13	170741	Geology	70	Success	
14	170744	Geology	57	Success	
15	170745	Geology	66	Success	
16	170749	Geology	64	Success	
17	170750	Geology	60	Success	
18	170751	Geology	64	Success	
19	170752	Geology	61	Success	
20	170753	Geology	53	Success	
21	170754	Geology	56	Success	
22	170755	Geology	62	Success	
23	170756	Geology	76	Success	
24	170757	Geology	55	Success	
25	170758	Geology	73	Success	
26	170760	Geology	69	Success	
27	170761	Geology	64	Success	
28	170763	Geology	64	Success	

Figure 4. System copy of results uploaded

A report is generated at the end of the upload to state the level of success and display data stored for each student for the course uploaded. The printed report is endorsed by the Course Lecturer and the Head of Department as security against tampering from System Administrators or system failure. Figure 4 shows the scores uploaded for students who took the course GEY234 with the date and time uploaded.

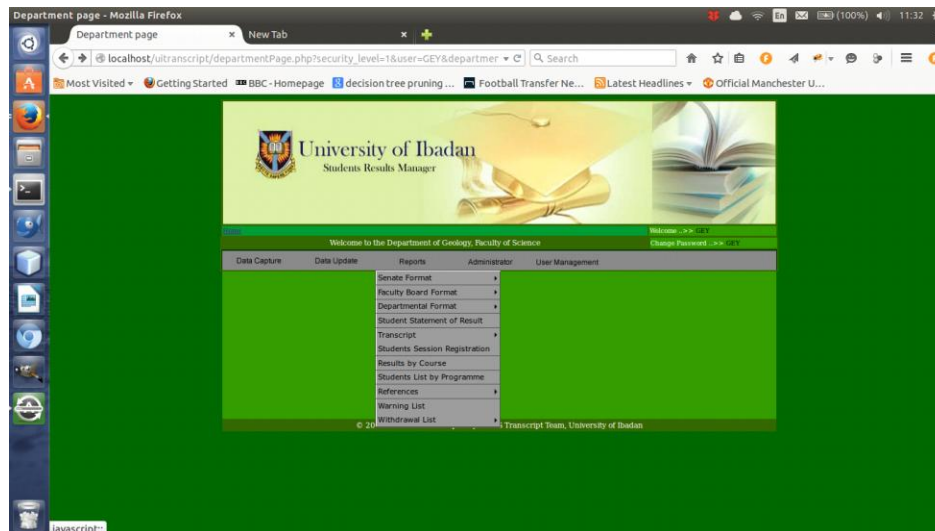


Figure 5. Report generation menu

Once results are uploaded different reports can be generated from the menu shown in Figure 5. Reports available include Senate, Faculty and Departmental format including transcript and statement of results.

UNIVERSITY OF IBADAN
2013/2014 EXAMINATION RESULTS
FACULTY OF SCIENCE
DEPARTMENT OF MICROBIOLOGY

FIRST CLASS HONOURS

157901 OKUNEYE, Tolope Olufunmi
157855 OLORUNKOSEBI, Mary Tomi

SECOND CLASS HONOURS (UPPER DIVISION)

157321 ABDULMALEEK, Shefiat Ahusiza
157327 ABOGUNRIN, Temitope Yetunde
157277 ADELABU, Adebola Rita
165345 AREMU, Oluwasayofunmi Olabisi
149348 ATIBAKA, Sandra Esegbuyola
157525 AWOSIKA, Olawale Vincent
157571 COKER, Alinuke Bamidele
157753 DANIEL, Ekene Ofor
157578 DASO, Emmanuel Olufemi
157620 FALOLA, Anthony Mobolaji
157648 IHEKAIRE, Ifeyinwa Susan
157673 KAYODE, Blessing Seun
149360 LAWAL, Olanrewaju Afiz
157773 OGUNRINDE, Nifemi Bunmi
150475 OKUDERO, Olayinka Yewande
157986 UZOKWE, Vivian Chinwendu

Figure 6. Senate Format for Graduating students

The list of graduating students can be generated based on class of degree, department and faculty. Figure 6 shows a sample for the 2014/2014 academic session in the Department of Microbiology under Faculty of Science.

UNIVERSITY OF IBADAN
2013/2014 SESSION DEGREE EXAMINATIONS
SUMMARY OF RESULTS
NON-FINAL YEAR STUDENTS
200 LEVEL 2013/2014 SESSION

FACULTY OF : SCIENCE **DEPARTMENT : MICROBIOLOGY**

S/N	Matric No	Year of Entry	Mode of Entry	Total units Regd. as at Last Semester	Units Passed	Cumul. Units Regd. to Date	Cumul. Units Passed to Date	Units not In	Cumul. WGP to Date	CGPA	Remarks
1	16339	2013/2014	TRA	18	18	32	32	0	122	3.8	PASSED
2	16394	2013/2014	TRA	18	18	35	31	0	95	2.7	PASSED
3	164002	2013/2014	TRA	21	21	38	38	0	123	3.2	PASSED
4	164024	2013/2014	TRA	21	21	38	38	0	139	3.7	PASSED
5	164058	2013/2014	TRA	21	21	38	38	0	142	3.7	PASSED
6	170473	2013/2014	TRA	21	18	38	35	0	113	3.0	PASSED
7	170488	2013/2014	TRA	21	17	38	34	0	105	2.8	PASSED
8	170508	2013/2014	TRA	21	21	38	38	0	162	4.3	PASSED
9	170509	2013/2014	TRA	24	24	41	41	0	157	3.8	PASSED
10	170549	2013/2014	TRA	21	21	38	38	0	165	4.4	PASSED
11	170801	2012/2013	UTME	57	57	74	74	0	426	5.8	PASSED
12	170803	2012/2013	UTME	57	54	74	71	0	345	4.7	PASSED
13	170805	2012/2013	UTME	60	54	80	70	0	278	3.5	PASSED
14	170806	2012/2013	UTME	57	47	74	60	0	210	2.8	PASSED
15	170807	2012/2013	UTME	57	47	77	63	0	184	2.4	PASSED
16	170808	2012/2013	UTME	57	44	77	64	0	190	2.5	PASSED
17	170809	2012/2013	UTME	60	48	77	65	0	228	3.0	PASSED

Figure 7. Faculty's format for Non-Final Year

The format for the presentation of non-final year students to the Faculty Board, shown in Figure 7, contains details for assessing a student performance without reference to specific courses. The report gives the Faculty Board an overview of the students' performance in a level of study without revealing personal data.

DEPARTMENTAL RESULTS FORMAT
UNIVERSITY OF IBADAN
B.SC. (MICROBIOLOGY)
2013/2014 DEGREE EXAMINATIONS
NON-FINAL YEAR RESULTS
200 Level

S/N	Matric No	Full Names	BIOC11 386	BIOC12 387	BOT114 401	BOT111 402	CHE107 404	CHE209 3319	CHE207 402	GES101 1198	GES102 1199	GES106 1033	GES107 1034	GES201 1026	MAT221 1733	MIC221 1716	MIC231 1717	STA201 2066	ZOO113 2079	ZOO211 3332	WOSP	Current Units Reg	Session GPA	TUR TEL EAM	OWSP	COFA
1	153339	AROUNDADE	45	49			64	71	42						63	71	55	54	59	122	32	3.8	32	122	3.8	
2	163884	ADEOLA	50	43			60	46	27						60	61	44	61	40	95	35	2.7	35	95	2.7	
3	164002	BUSARI	45	56	55		62	59	40						52	68	46	61	45	123	38	3.2	38	123	3.2	
4	164024	LAWRENCE	61	52	60		68	73	40			41			52	70	42	64	50	139	38	3.7	38	139	3.7	
5	164058	BORYAN	51	52	52		69	71	40						64	66	60	67	49	142	38	3.7	38	142	3.7	
6	170473	AKINBAMI	47	57			47	64	41	47				56	56	70	50	58	36	113	38	3.0	38	113	3.0	
7	170488	IBRAHEEM	0	54			52	57	40	58				52	46	71	67	50	48	105	38	2.8	38	105	2.8	
8	170508	OPELOLAWA	53	55			78	55	40	49				62	66	68	71	60	47	162	38	4.3	38	162	4.3	
9	170509	OTUNLA	50	52	65		65	60	40	53				60	58	63	57	54	53	157	41	3.8	41	157	3.8	
10	170549	OLAKANNI	55	51			65	59	40	68				67	64	72	60	67	54	166	38	4.4	38	166	4.4	
11	170801	ADEGBOLA	60	66			77	86	55	69				68	77	74	72	62	56	224	38	5.9	74	224	5.9	
12	170803	ADEWOLE	61	48			73	73	56	51				64	67	58	68	44	54	167	38	4.4	74	167	4.4	
13	170805	AKINYEMI	42	62	56		65	63	26	56				51	62	61	62	55	46	155	44	3.5	80	278	3.5	

Figure 8. Departmental Formats for Non-Final year students

In Figure 8 the departmental format for result processing shows the scores for the courses taken by students at a level of study. This report guides lecturers at the departmental level in assessing students and making decisions.

B.SC. (GEOLOGY)
FACULTY OF SCIENCE
UNIVERSITY OF IBADAN

Statement of Results

Matriculation Number : 157688 Full Name : LETSUWA Moyosoreoluwa Toluwannimi
 Session of Admission : 2012/2013 Level at Admission:
 Mode of Entry: UTME

100L Session: 2012/2013

Course Code	Course Title	Unit	Mark	Remarks	GP	Grade Point
CHE195	Practical Chemistry	2	76	Passed	7	14
GES107	Reproductive Health: Sexually Transmitted Infections (STI)	2	66	Passed	6	12
CHE127	Inorganic Chemistry	3	54	Passed	3	9
CHE177	Organic Chemistry	3	55	Passed	4	12
GES101	Use of English	3	66	Passed	6	18
PHY112	Electricity and Electrostatics	3	62	Passed	5	15
PHY113	Basic Principles of Physics III - Waves, Optics and Mod	3	52	Passed	3	9
PHY114	Basic Principles of Physics I	3	32	Failed	0	0
PHY115	Basic Principles of Physics V	3	54	Passed	3	9
PHY118	Experimental Physics I	3	61	Passed	5	15
ZOO113	Diversity of Animal Life	3	34	Failed	0	0
CHE157	Physical Chemistry	4	44	Passed	1	4
GEY101	Introduction to Geology	4	50	Passed	3	12
MAT111	Algebra	4	41	Passed	1	4
MAT121	Calculus and Trigonometry	4	36	Failed	0	0
STA111	Descriptive Statistics	4	56	Passed	4	16

Total Units Registered: 51

Figure 9. Statement of Results

Statement of Results, as in Figure 9, are used to report the academic progress of students who are not graduating but require an official record of their academic performance e.g. scholarship, grants, visas. The system uses available results in the database to generate this report. At the University of Ibadan, statement of results is generated for students at the end of each semester and session. The Statement of Results can be sent to the e-mail addresses provided by students in their bio-data.

UNIVERSITY OF IBADAN
STATEMENT OF RESULTS

Matriculation Number : 157888
Course of Study: B.Sc. (GEOLOGY)
Date of Birth : 1994-08-19
Year of Admission : 2012/2013
Class of Degree:
Mode of Entry: UTME

Full Name : LETSUWA Toluwannimi Moyosoreoluwa
Faculty : SCIENCE
Sex: Male
Nationally: Nigerian
Year of Graduation : 2013/2014

COURSE	YEAR	COURSE DESCRIPTION	UNITS	REMARKS	MARKS
CHE195	2012/2013	Practical Chemistry	2	Passed	76
GES107	2012/2013	Reproductive Health: Sexually Transmitted Infection	2	Passed	66
CHE127	2012/2013	Inorganic Chemistry	3	Passed	54
CHE177	2012/2013	Organic Chemistry	3	Passed	55
GES101	2012/2013	Use of English	3	Passed	66
PHY112	2012/2013	Electricity and Electrostatics	3	Passed	62
PHY113	2012/2013	Basic Principles of Physics III - Waves, Optics and Mod	3	Passed	52
PHY114	2012/2013	Basic Principles of Physics I	3	Failed	32
PHY115	2012/2013	Basic Principles Of Physics V	3	Passed	54
PHY118	2012/2013	Experimental Physics I	3	Passed	61
ZOO113	2012/2013	Diversity of Animal Life	3	Failed	34
CHE157	2012/2013	Physical Chemistry	4	Passed	44
GEY101	2012/2013	Introduction to Geology	4	Passed	50
MAT111	2012/2013	Algebra	4	Passed	41
MAT121	2012/2013	Calculus and Trigonometry	4	Failed	36
STA111	2012/2013	Descriptive Statistics	4	Passed	56
GEY234	2013/2014	Mineral Resources	2	Passed	63
GEY201	2013/2014	Physical Geology	2	Passed	57
GEY247	2013/2014	Principles of Stratigraph	2	Passed	68

Figure 10. University Transcript

The program generates the University Transcript as shown in Figure 10. The process is automated and based on scores in the database. The student must fulfill all regulations, as stated in the Faculty Handbook, to graduate before the system can generate a transcript. The transcript can be printed and endorsed for official use.

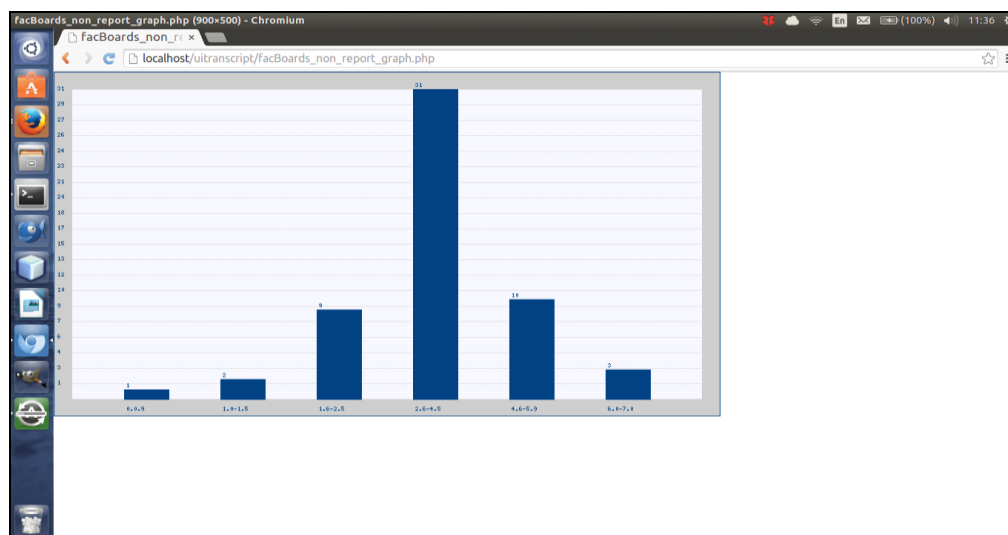


Figure 11. Performance reports

The program has a built-in analytical tool that produces charts of academic performance of students in a level of study, department and faculty. The charts are generated using the Cumulative Grade Point Average (CGPA) of the students. In Figure 11 the chart shows that only 5 students are in the first class division and 31 in the second class upper division category.

CONCLUSIONS AND RECOMMENDATIONS

Result processing and Transcript generation, that had been done manually and in a difficult manner, has been digitized by this software. The design of the software is based on university regulations for admission and graduation, senate approved curriculum and security requirements. In this work, a system capable of collecting students scores, storing the scores for each student, securing the scores, calculating the results per semester with cumulative grade point, generating reports that meet university and external agencies requests, and providing multiple ways of sharing the results. The Agile method of software development was used to make the design iterative and development faster. The result processing and Transcript system is functional and operational at the University of Ibadan, Nigeria.

ACKNOWLEDGEMENTS

The authors would like to appreciate Professor I. P. Farai for testing the software in the Faculty of Science and encouraging other faculties to adopt the software. Prof Gbemisola Oke (Deputy Vice-Chancellor: Academic 2015-2017) is recognized for supporting the project at management level. The hard work of Olusegun Olagoke, Esther Alabi, Wuraola O. Wuraola, Elizabeth Ogunseye and Tope Khadijat in data entry, verification and training are also acknowledged. All examination officers and heads of departments of participating Faculties are acknowledged for their support.

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