



Development and Validation of Result and Transcript Management System for University of Jos, Plateau State

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Abstract

The importance of results computation, and accurate academic records in educational establishments cannot be overemphasized. Hence the need for a robust, efficient, accurate and comprehensive academic result computation system. A user-friendly Result and Transcript Management System (RTMS) was designed for uploading of results, and computation of 'Senate format', for the University of Jos, Nigeria. The software was developed using Python, it was compiled as a standalone executable Graphical User Interface (GUI) toolkit; not requiring any programming language or dependencies. The system was designed to work on Windows operating system. This result computation toolkit was designed to ease result computation as the job of Level Coordinators are made easier, and more efficient. This software is designed to be hosted on one machine for each department; all results for that department will be uploaded on that machine (computer) and processed. The scores are not manually entered into the system, rather each lecturer submits a softcopy of their results to the departmental Exam Officer who collates the results in one Excel workbook, with each sheet named using the Course Code. The software automatically loops through the Excel workbook sheets, uploads each course, and locates each student, in their current level and assigns their scores and grades to them. This mitigates the errors due to manual entering of results. This tool automates the entire process about result computation ranging from creation of workbooks, uploading and validation of registrations, uploading of previous records, uploading of individual course results from Course Lecturers, computation of cumulative performance indices and preparation of summary pages.

Keywords: Graphical User Interface (GUI), Registration, Academic Result, Computation.

Introduction

Result computation and processing is a very sensitive and demanding exercise. Every session, Level Coordinators are tasked with the responsibility of preparing results of the levels they coordinate. This reduces the efficiency and productivity of these members of staff as most of their useful time is spent on result preparation with little or no time for research, and self-development resulting in a poor lecture delivery. Manually prepared results are prone to human errors and bias. More so, as the results is been prepared by many individuals (Level Coordinators), the security and reliability of the results cannot be guaranteed.

Despite the fact that the results are prepared by many individuals, it takes time for each level coordinator to finish preparing his levels result, leading to late or untimely presentation of results to students. Sometimes a student may have been withdrawn, but as results may not have been completed and released before the commencement of the new session, such students often fall

victims of registering for the new session, paying their tuition fees, accommodation, etc. only to be informed in the course of their studies that they have been withdrawn. This is highly frustrating and can lead to academic and psychological depression (Belfield, 2012; Käfer et al., 2019). Several teams and individuals have developed tools for computation of 'Senate Format' result for University of Jos, Nigeria. The senate format is the form the University Senate expects the Departmental results to be presented for consideration and approval. One of such tools was developed by Akinola (2014) to compute Total Credit Registered (TCR), Total Credit Earned (TCE), Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) However, this tool demanded that the spreadsheet containing the students' scores should be manually prepared and the content of the spreadsheet be copied and pasted in any text editor before it can be used by the software. This was found to be cumbersome and prone to middle 'man' errors. Once a syntax error is encountered, execution will stop with no feedback to the user.

Another tool was developed but, in this case, all the courses offered by the students from their entry session (level) to the current level has to be prepared using a spreadsheet, and presented to the software for computation of each current cumulative performance of the students. For both tools, the programming language used in designing the tools had to be installed, along with their dependencies, causing significant challenges in getting the tool to install on some computers. Therefore, this paper presents the design and development of a robust and comprehensive result computation toolkit for the University of Jos. The tool was developed using Python which has a robust library for manipulating spreadsheets (Meier, 2015) and compiled as a standalone windows application (Tutorial Point, 2016), (Burkhard, 2017). Hence no need of installation of Python or any dependencies as in some related applications. No programming skill or knowledge is required before using the developed RTMS. A GUI provides an interface between the user and the software. Many of the possible errors were captured, and for each of those errors, feedback is presented to the user via a message box explaining the problem and possible solutions. The description and functionality of the tool is presented in the next section, followed by conclusion and recommendation.

Software Toolkit Description

A brief description of some of the functionality of the designed result computation and academic records management toolkit are presented in this section. This tool is aimed at automating the processes relating to result computation and managing of academic records (transcripts). The toolkit has 21 main functions depicted by a dropdown box. These functions are arranged from first to last in order of which they should be executed where applicable. Only six of these functions are presented in this paper, among these are: uploading of transcript courses, creation of workbooks, uploading and validation of registrations, uploading of previous records, uploading of individual course results, computation of sessional and cumulative performance indexes and preparation of summary pages. As the tool is standalone Windows application software, once the software is installed, double clicking on the shortcut executable icon, the main GUI shown in Fig.1 will appear. Each function to be executed will be selected from the dropdown box in the main GUI.

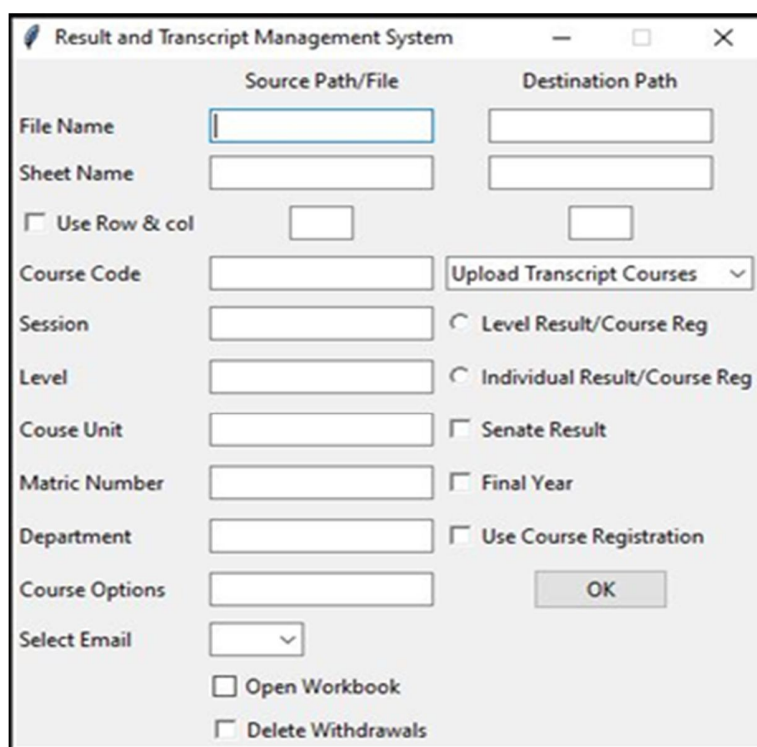


Fig. 1: Main GUI

Upload Transcript Courses

The Upload Transcript Courses' feature is used to upload all the courses that will be used to create workbooks, and for preparation of academic transcripts. All the courses offered in the department including electives are to be uploaded in the format depicted in Fig. 2. The first column should be levels, followed by the course code, course title, semester, credit unit, prerequisites, option (specialization to which the course is meant for), and entry mode. All the options offering each course should be specified. This function is to be executed only once except if there is need to update the courses due to curriculum review or addition of courses or specializations within the department, in this case the updated one has to be uploaded which will automatically replace the previous one.

Create New Workbook

The Create New Workbook Feature is used to prepare a new workbook. The following information should be completed on the main GUI i.e., the session, level and the department. When the level is specified, all the required courses needed to create the new workbook will automatically be sourced from the courses uploaded in transcript courses. On clicking the OK button of the main GUI, a top-level GUI will be opened as shown in Fig. 3. The University, faculty, department and the degree in view are to be completed. The information provided on this top-level GUI will be the headings of the workbook. On clicking the OK button of the top-level GUI, the workbook will be created along with five sheets and a message box will be displayed as shown in Fig 4. The five sheets created are

named: Senate Form, Level Form, Senate Summary, Course Summary and Course Registration. The newly created workbook will be displayed as shown in Fig 5.

Upload Record

The Upload Record feature of RTMS was designed for use in bringing the records of students to the next level. If this is not the first time of using the software, when uploading records, the software will source the records of current level and session from last session, next lower level. All the students that were withdrawn based on academic deficiency, will not be brought to the current level/session, but their records will not be deleted from where they were withdrawn. The records of the students including their cumulative record where applicable will be saved in the new workbook.

LEVEL	COURSE CODE	COURSE TITLE	semester	CREDIT UNITS	PREREQUISITE	OPTION	ENM
100	CHM 106	Practical Inorganic Chemistry I	2	1		ALL	UME
100	MTH 101	Elementary Mathematics I- Algebra	1	3		ALL	UME
100	MTH 102	Elementary Mathematics II-Vectors	2	3		ALL	UME
200	EEE 203	Electronics, Measurements	1	2		ALL	ALL
200	EEE 211	Basic Engineering Laboratory I	1	1		ALL	ALL
200	MTH 201	Mathematical Methods I	2	3	MTH 101	ALL	ALL
200	MTH 202	Elementary Differential Equations I	2	3	MTH 102	ALL	ALL
300	EEE 301	Circuit Theory and Systems I	1	3	EEE 201	ALL	ALL
300	EEE 302	Circuit Theory and Systems II	2	2	EEE 202	ECE,PAM	ALL
300	EEE 303	Electromagnetic Fields and Waves	1	2		ALL	ALL
300	EEE 305	Physical Electronics	1	3		ALL	ALL
300	MTH 341	Numerical Analysis	1	3	MTH201	ALL	ALL
300	MTH 342	Complex Analysis	2	3	MTH202	ECE	ALL
400	EEE 401	Power Engineering II	1	2	EEE301	ALL	ALL
400	EEE 403	Telecommunication Principles	1	2	EEE303	ALL	ALL
400	EEE 411	Laboratory Practical and Mini-Project	1	2		ALL	ALL
500	EEE 501	ADVANCE CIRCUIT THEORY	1	3	EEE401	ALL	ALL
500	EEE 503	ADVANCED ELECTROMAGNETIC FIELDS	1	3	EEE403	ALL	ALL
500	EEE 505	ENERGY SYSTEMS AND MANAGEMENT	1	2		ALL	ALL
500	EEE 507	POWER SYSTEMS PROTECTION	1	2		ALL	ALL
500	EEE 509	ENGINEERING MANAGEMENT	1	2		CE	ALL

Fig. 2: Transcript Courses



Fig. 3: New Workbook Top Level GUI

Fig. 4: New Workbook Sheets

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FACULTY OF ENGINEERING																				
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING																				
100 B.ENG ELECTRICAL AND ELECTRONIC ENGINEERING 2021/2022 SESSION																				
S/N	MAT.NO	NAME	ME	MNS#NSS	100 Level Summary				CHM	GP	CHM	GP	CHM	GP	CHM	GP	MTH	GP	MTH	GP
					TCR	TCE	TGP	GPA	Remark	101	103	105	106	101	102					
										3	1	3	1	3	3					

Fig. 5: New Book Sheet

Upload Course Registration

The Upload Course Registration feature is used to upload courses registered by the students in a format shown in Fig. 6. For any course a student registers, 1 is entered or anything including alphabets but not zero. Any cell with zero or empty implies that the student did not register that course. Upload the course registration shown in Fig. 6 to populate the course registration sheet created by the software. The software will check and deregister any student who registers a course for which he/she has not passed the prerequisite, and those that register courses that they have already passed. The software will put 1 for valid registration, and P where the student registered course he/she has already passed, and 0 for courses registered with pending prerequisite. The valid total credit registered will be computed, if it falls below the minimum, it will be coloured blue, and red if it is above the maximum required credit load. All pending course(s) to be cleared will be on the summary column of the registration sheet as shown in Fig. 7. Only courses for which the student has a valid registration will be uploaded and assigned to them. This function ensures that if a student sits for an exam in a course not registered, previously passed, or has not passed the prerequisite where applicable, the score will not be assigned to the student.

Upload Course Result

The Upload Course Result section of the RTMS is used to upload individual course results. The source workbook, sheet and row where the scores start has to be specified along with the column containing the total score. The first column is the serial number, next is the matriculation number, followed by the students' names. Any column can be used for the total score but it must be preceded by the columns for continuous assessment (CA) and Exam where applicable. The scores are not manually entered into the system, rather each lecturer submits a softcopy of their results to the departmental exam officer who will collate the results in one Excel workbook in a format depicted in this section, with each sheet named using the course code. The software automatically looped through the workbook sheets, and upload each course result. Only courses where a student has valid registration will be assigned to them. All the scores whose matric numbers were not found, including those that have pending prerequisites or did not register the course or has once passed the course, will be saved in a separate sheet. The tool is highly robust, hence, irrespective of the student level, the software searches and assigns each student mark appropriately. In this way, the work of Level Coordinators is greatly reduced. The results for all the courses in a department will be collated and prepared/computed on one machine. Omitted results that may be brought after can also be uploaded. If there is error in any result uploaded, you can re-upload the corrected one to replace the erroneous one. The course summary sheet will be populated as courses were uploaded as depicted in Fig 8.

Computation of Cumulative

The Compute Cumulative feature is used to compute the sessional or semester performance of the students i.e. the total credit register (TCR), total credit earned (TCE), total grade point (TGP) and grade point average (GPA); and the cumulative performance indexes where applicable i.e.



Cumulative Total Credit Register (CTCR), Cumulative Total Credit Earned (CTCE), Cumulative Total Grade Point (CTGP) and Cumulative Grade Point Average (CGPA). It also provides a remark, such as pass (no pending course), courses to be repeated and those to register. In addition to this, the remark includes voluntary withdrawal for students with no score in all the courses, and withdrawal based on academic deficiencies. Students on probation are also specified in the remark as shown in Fig. 9. The prepared result depicted in Fig. 9 is what is referred to as the Senate format for University of Jos.

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100 B.ENG ELECTRICAL AND ELECTRONIC ENGINEERING 2019/2020 SESSION														
S/N	MAT.NO	NAME	ME	OPTIO	REMARK	TCR	CHM 101	CHM 103	CHM 105	CHM 106	CS 101	CS 102	MTH 101	MTH 102
							3	1	3	1	2	3	3	3
1	UJ/2015/EN/0120	GH	UME	CE			1	1	1	1	1		1	1
2	UJ/2015/EN/0009	JJ	UME	CE			1	1	1	1	1		1	1
3	UJ/2015/EN/0118	KO	UME	CE			1	1	1	1	1	1	1	1
4	UJ/2015/EN/0023	LP	UME	CE			1	1	1	1	1	1	1	1
5	UJ/2014/EN/0001	MK	UME	CE			1	1	1	1	1	1	1	1
6	UJ/2014/EN/0086	HJ	UME	CE			1	1	1	1	1	1	1	1
7	UJ/2019/EN/0141	GT	UME	CE			1	1	1	1		1	1	1
8	UJ/2019/EN/0164	JY	UME	CE			1	1	1	1	1	1	1	1
9	UJ/2019/EN/0236	ABU	UME	PAM			1	1	1	1	1	1	1	1
10	UJ/2018/EN/0045	ATBU	UME	PAM			1		1	1	1	1	1	1
11	UJ/2016/EN/0223	UU	UME	PAM			1	1	1	1		1	1	1
12	UJ/2016/EN/0098	HH	UME	PAM			1	1	1	1	1	1	1	1
13	UJ/2016/EN/0018	HJ	UME	PAM			1	1	1	1	1	1	1	1
14	UJ/2018/EN/0071	HY	UME	PAM			1	1	1	1	1		1	1
15	UJ/2018/EN/0073	GH	UME	PAM			1	1	1	1			1	1
16	UJ/2018/EN/0075	EJEBA ang	UME	PAM			1	1	1	1			1	1

Fig 6. Registration to be uploaded

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500 B.ENG ELECTRICAL AND ELECTRONIC ENGINEERING 2023/2024 SESSION														
S/N	MAT.NO	NAME	ME	OPTION	Remark	TCR	EEE 501	EEE 503	EEE 505	EEE 507	EEE 509	EEE 511	EEE 401	EEE 403
							3	3	2	2	2	2	2	2
1	UJ/2015/EN/0120	DZUNGWE Terence Aondongu	UME	CE	REG: CHM101, EEE302, EEE403, EEE501, EEE503,	12	0	0	1	1	1	1	1	0
2	UJ/2015/EN/0009	IBRAHIM Muhammed Awwal	UME	PAM		14	1	1	1	1	1	1	P	P
3	UJ/2015/EN/0118	BAGU Dorcas Nenadi	UME	CE		14	1	1	1	1	1	1	P	P
4	UJ/2015/EN/0023	JOHN Ayuba Pam	UME	ECE		14	1	1	1	1	1	1	P	
5	UJ/2014/EN/0001	SAMUEL Oluwatimilehin Emmar	UME	CE	REG: CHM106, MTH201, MTH202, MTH341, MTH342,	14	1	1	1	1	1	1	P	
6	UJ/2014/EN/0086	SHUAIBU Ibrahim Muhammed	UME	CE		14	1	1	1	1	1	1	P	
7	UJ/2019/EN/0141	OKWUIA Victor Oyare	UME	CE		14	1	1	1	1	1	1	P	
8	UJ/2019/EN/0164	NWAFOR Rejoice Chinasa	UME	CE	REG: MTH202, MTH342,	14	1	1	1	1	1	1	P	
9	UJ/2019/EN/0236	FOLORUNSHO Enoch Oluwadara	UME	PAM	REG: CHM105, EEE305,	14	1	1	1	1	1	1	P	
10	UJ/2018/EN/0045	FRANCIS Wisdom	UME	PAM		20	1	1	1	1	1	1	P	
11	UJ/2016/EN/0223	EWUGA Bathsheba Ashezi	UME	PAM	REG: EEE211, EEE407,	14	1	1	1	1	1	1	P	
12	UJ/2016/EN/0098	IKWUOCHE Ogbene Blessing	UME	PAM		14	1	1	1	1	1	1	P	
13	UJ/2016/EN/0018	PAM Dorcas Chuhwak	UME	PAM		14	1	1	1	1	1	1	P	P
14	UJ/2018/EN/0071	BULUS Nanpyal Gwakbong	UME	PAM	REG: CHM103, EEE203, MTH201, MTH202, MTH341, I	13	1	0	1	1	1	1	P	1

Fig. 7: Validated Registration

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FACULTY OF ENGINEERING												
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING												
500 B.ENG ELECTRICAL AND ELECTRONIC ENGINEERING 2023/2024 SESSION												
SUMMARY												
S/NO	COURSE COD	COURSE TITLE	CREDIT UNITS	A	B	C	D	F	PASS	FAIL	TOTAL	SHEET
1	EEES01	ADVANCE CIRCUIT THEORY	3	2	9	5	2	2	18	2	20	14
2	EEES03	ADVANCED ELECTROMAGNETIC FIELDS	3	3	4	3	3	7	13	7	20	16
3	EEES05	ENERGY SYSTEMS	2	6	1	5	2	6	14	6	20	18
4	EEES07	POWER SYSTEMS PROTECTION	2	2	4	9	3	2	18	2	20	19
5	EEES09	ENGINEERING MANAGEMENT	2	2	4	9	3	2	18	2	20	20
6	EEES11	RELIABILITY AND MAINTANABILITY	2	3	4	7	2	4	16	4	20	21

Fig. 8: Course Summary

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100 B.ENG ELECTRICAL AND ELECTRONIC ENGINEERING 2019/2020 SESSION																		
S/N	MAT.NO	NAME ME	MNSA	NSS	100 Level Summary				Remark	CHM	GP	CHM	GP	CHM	GP	CHM	GP	
					TCR	TCE	TGP	GPA		101	103	105	106					
1	Uj/2015/EN/019	CF	UME	15	2	14	11	34	2.43	RPT: CHM101,	3	0	60	4	50	3	50	3
2	Uj/2015/EN/0999	GH	UME	15	2	14	14	46	3.29	PASS	68	4	80	5	55	3	45	2
3	Uj/2015/EN/0118	DD	UME	15	2	14	14	49	3.5	PASS	55	3	60	4	70	5	55	3
4	Uj/2015/EN/0023	GH	UME	15	2	14	14	63	4.5	PASS	67	4	45	2	88	5	60	4
5	Uj/2014/EN/0001	JK	UME	15	2	14	13	48	3.43	RPT: CHM106,	58	3	55	3	45	2	33	0
6	Uj/2014/EN/0086	KL	UME	15	2	14	14	52	3.71	PASS	45	2	66	4	77	5	56	3
7	Uj/2019/EN/0141	KL	UME	15	2	14	14	41	2.93	PASS	68	4	45	2	45	2	55	3
8	Uj/2019/EN/0164	KP	UME	15	2	14	14	58	4.14	PASS	66	4	45	2	66	4	46	2
14	Uj/2018/EN/XX71	OK	UME	15	2	14	7	15	1.07	Probation, RPT: CHM103, MTH101	45	2	33	0	45	2	58	3
15	Uj/2018/EN/0073	XX	UME	15	2	8	5	19	2.38	RPT: CHM105,	68	4	45	2	34	0	77	5
16	Uj/2018/EN/0075	PP	UME	15	2	14	14	60	4.29	PASS	50	3	54	3	78	5	50	3
17	Uj/2018/EN/0084	XC	UME	15	2	14	14	62	4.43	PASS	60	4	48	2	89	5	55	3
18	Uj/2018/EN/0087	CV	UME	15	2	14	11	39	2.79	RPT: CHM105,	70	5	45	2	43	0	60	4

Fig. 9: Senate Format Result

Conclusion

This research is focused on the development of Result and Transcript Management System (RTMS) for University of Jos, Nigeria. The tool is developed to ease the work of level coordinators by automating results processing processes. As the results are uploaded and not entered manually by the exam officer, human entering errors are mitigated. The tool was first used by Civil Engineering Department of University of Jos for computation of their senate format results for 2019/2020 academic session. Seeing how accurate, efficient, and reliable the computation outcome of the tool, the entire Faculty of Engineering of the University of Jos has adopted the tool. Currently, the Faculty of Education and Arts which are the Two largest Faculties in University of Jos, have placed a demand for the tool to be deployed to them. The RTMS is robust and user friendly, no programming knowledge is required to use the tool. In addition to this, no installation of any programming language or their dependencies is required as the tool is compiled as a standalone GUI toolkit. With this tool, all results for a given department will be collated on one machine where computation of cumulative performance indices for all the levels will be carried out. Future work will include efficient electronic dissemination of results and registration status to students, moderation of results and preparation of academic transcripts.



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