RESEARCH PROPOSAL ON

**INTRANET-BASED VIRTUAL LABORATORY SYSTEM FOR EFFECTIVE PROGRAMMING CLASSES AND PROGRAMMING PRACTICALS IN COMPUTER SCIENCE DEPARTMENT OF AKANU IBIAM FEDERAL POLYTECHNIC, UNWANA**

BY

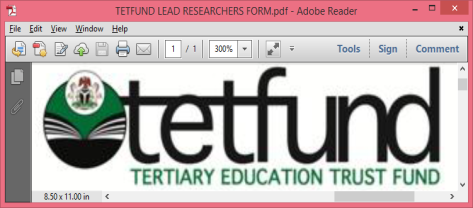
**EZEORAH, EZEKIEL UCHECHI** (MSc, Computer Science)

**MADUBUIKE, CHIBUIKE EZEOCHA** (MSc, Information Technology)

**ONUORA, AUGUSTINE CHIDIEBERE** (MSc, Information Technology)

DEPARTMENT OF COMPUTER SCIENCE

AKANU IBIAM FEDERAL POLYTECHNIC, UNWANA

PROUDLY SPONSORED BY

Department of Computer Science

Akanu Ibiam Federal Polytechnic Unwana

P.M.B 1007, Afikpo,

Ebonyi State.

March , 2019

**The Executive Secretary**

Tertiary Education Trust Fund,

Off Aguiyi Ironsi Street, Maitama,

Abuja.

Through: **The Rector**,

Akanu Ibiam Federal Polytechnic, Unwana.

Through: **The Chairman**,

Polytechnic Research Committee, (OR DEPARTMENT OF ACADEMIC PLANNING)

Through: **The Dean**,

School of Science

Through: **The Head**,

Department of Computer Science,

Sir,

**APPLICATION FOR INSTITUTION BASED RESEARCH GRANT FOR THE DEVELOPMENT OF AN INTRANET-BASED VIRTUAL LABORATORY SYSTEM (WEB APP) FOR EFFECTIVE PROGRAMMING CLASSES AND PROGRAMMING PRACTICALS IN COMPUTER SCIENCE DEPARTMENT OF AKANU IBIAM FEDERAL POLYTECHNIC, UNWANA**

We humbly apply for the TETFUND institution based research grant to enable us carry out a research on the development of an intranet based virtual laboratory system (web App) for both programming classes and programming practical in computer science department of Akanu Ibiam Federal Polytechnic, Unwana.

The research is expected to commence from June 2019 and end in June 2020. The duration of this research will enable us accommodate all the necessary functional and non-functional requirements of the system. We strongly believe that the culture of programming will be strongly revived amongst our students in Akanu Ibiam Federal Polytechnic, Unwana on a successful implementation of this research.

Thank you for your consideration and approval.

Yours faithfully,

EZEORAH, Ezekiel Uchechi

AIFPU/REG/SS/

Principal Researcher

**TETFUND/ESS.D/10./LR/PROFILE/RES**

****

**TETFUND INSTITUTION-BASED RESEARCH INTERVENTION ALLOCATION:**

**Batch No. of Submission:…..…………**

**LEAD RESEARCHER’S PROFILE FORM**

**(To be completed by Lead Researcher (LR) and Beneficiary institution)**

**YEAR OF INTERVENTION-----------------------------**

**LEAD RESEARCHER ’S**

**PASSPORT PHOTOGRAPH**

(i) Name of Lead Researcher (Staff)………………………………………………………………....……….

(ii) Gender: Female Male

(iii) Date of Birth:………………………………………………….…………………………………………..…..

(iv) Institution (i.e. Duty Post/Beneficiary Institution) ……………………………………………….………..

……………………………………………………………………………………….…………….………......

(v) Lead Researcher (Staff) Category: Academic Staff Non Academic Staff

(vi) Signature of Lead Researcher (Staff) ………………………………….…………………………………

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **DETAILS OF LEAD RESEARCHER’S DATA/INSTITUTIONAL RECORDS** | | |
| 1. | Department (of Lead Researcher) |  | |
| 2. | Qualifications of Lead Researcher with Dates | Degree(s)  -----------------------------------------------------  -----------------------------------------------------  ------------------------------------------------------ | Date Obtained:  ---------------------------------  ----------------------------------  ---------------------------------- |
| 3. | Dated of 1st Appointment |  | |
| 4. | Duration of Entire Work Experience |  | |
| 5. | Number of Years spent in the Institution |  | |
| 6. | Research Topic/Title | **Research Details**  (a) Research Area/Focus\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  (b) Duration of Research (in Months)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  (c) Research commencement and completion dates from:\_\_\_\_\_\_\_\_\_\_\_\_\_To \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  (d) Lead Researcher’s: (E-mail & Phone No).\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| 7. | **Research Project Cost (Total):**  N…………………………….. | **Research Project Cost Implication/Breakdown (Outline Cost key items &specify Costs in N)**  (a) ……………………………………………………………………………  (b) ……………………………………………………………………………  (c) ……………………………………………………………………………  (d) ……………………………………………………………………………  (e) ……………………………………………………………………………  etc. | |
| 8. | Lead Researcher’s Official Salary Bank Account Details | **Bank Account Details**  (a) Bank Name Branch…………………………………………………  (b) Account Name……………………………………………………....  (c) Account No………..………………………………………………..  (d) Sort Code……….………………………………………………... | |
| 9. | Other Remarks (if any) | | |

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*Signature & Name of* ***DVC (Academics) for Universities****/****Director Academic Planning (for Polytechnics/COEs) including Stamp & Date***

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Signature of Vice Chancellor/Rector/Provost* ***(Including Stamp & Date)***

Annex 1

Institution Based Research (IBR) Research Proposal Template/Format

|  |
| --- |
| Principal Researcher/Investigator |
| Name: EZEORAH, EZEKIEL UCHECHI  Institution: AKANU IBIAM FEDERAL POLYTECHNIC UNWANA  Department: COMPUTER SCIENCE  Telephone: +2348068346738, +2348059881367  Email: euezeorah@akanuibiampoly.edu.ng |
| Co-Researcher(s) (if any) |
| Name: MADUBUIKE, CHIBUIKE EZEOCHA  Institution: AKANU IBIAM FEDERAL POLYTECHNIC UNWANA  Department: COMPUTER SCIENCE  Telephone: +2347036947457  Email: cemadubuike@akanuibiampoly.edu.ng  Name: ONUORA, AUGUSTINE CHIDIEBERE  Institution: AKANU IBIAM FEDERAL POLYTECHNIC UNWANA  Department: COMPUTER SCIENCE  Telephone: +2348065282082, +2349051824188  Email: aconuora@akanuibiampoly.edu.ng; |
| Project Title |
| **INTRANET-BASED VIRTUAL LABORATORY SYSTEM FOR BOTH PROGRAMMING CLASSES AND PROGRAMMING PRACTICALS IN COMPUTER SCIENCE DEPARTMENT FOR AKANU IBIAM FEDERAL POLYTECHNIC, UNWANA** |
| Executive Summary |
| Practical learning which is the bedrock of Polytechnic education in Nigeria is gradually losing its feet as a result of inadequate laboratories. In recent times, it has become difficult for students to match classroom theories with laboratory practical. In this research, the researchers intend to develop a system that combines both virtual learning and virtual laboratory in a single platform. This proposed system allows students to log into the new system (web portal) from their web-enabled mobile devices, in other to take programming courses; and as well, write and test programs in the selected course. The programming courses are packaged as online text tutorials. After each learning session, student can practice the codes using the thin client interface of their light-weight mobile devices. Submissions will be made afterward to the web server for compilation/interpretation. Our system will be implemented to support ten (10) popular programming languages Java, C, C++, HTML, CSS, Java Script, Fortran, COBOL, PHP and Python; and will be run via networked wireless local area network (WLAN) to enable students within the campus coverage access the service at no extra cost with their web-enabled devices (laptops, Palmtops, Ipads, Smart phones etc). This proposed system when implemented will be very useful to students aspiring for personalized learning; will serve as an alternative to the physical laboratory and as well support training institutions overcome the problems of both shortage of computers and shortage of programming tutors. |
| Introduction |
| Electronic learning (E-learning) also known as virtual learning is a social system focused on the permanent development and certification of human knowledge and competencies in a specific domain in which the subsystems can occur distributed in time and place, and in which ICT (Information Communication and Technology) ensures, integration, representation, personalization, cooperation and Process management (Koper, 2000). E-learning can also be defined as the use of Internet technologies to create and deliver a rich learning environment that include a broad array of instruction and information resources and solutions, the goal of which is to enhance individual and organization (Allen, 2007). On the other hand, a web-based laboratory (WBL) or virtual laboratory is a network based system for performing laboratory experiments. It involves selection and performing experiments, data acquisition, storage, analysis and transmission (Onibere, et al 2009).  While some authors have argued that both traditional classroom learning and e-learning has their merits and demerits (for example the traditional classroom learning enforces strict compliance to time and availability of both the learner and the teacher to complete a course in a collaborate fashion but cannot guarantee personalized learning), others believe that e-learning provides the convenience and comfort for personalized learning but in most cases cannot determine when the student has completed a course (Onyejegbu, Asor & Ugwu, 2009). Jonah, et al (2009), however, advised that virtual laboratory should be used to complement the existing conventional laboratory instead of serving as a replacement. |
| Problem Statement Justification |
| The fact that computer programming languages are daily increasing in number is no longer news. However, the rate at which the students practice these programming skills is a far cry from the level of expertise required from them after graduation. This is due to lack of sufficient systems in different computer laboratories; lack regular and sufficient power supply; the high cost of purchase of compilers and development environment; cost of engaging a programming coach; and inaccessibility of most programming resources which are in research form. For example, in a competition conducted by the National Mathematical Centre to select students of Computer Science who will represent the Country in an upcoming international programming competition. Six (6) problems on C++ and Java programming were given to each of the twenty-five (25) teams from different universities to solve in five (5) hours. Each participating team comprise of three (3) students representing their schools. The result of the competition showed the high level of deficiency in programming in modern programming language in the department of computer science. This is because, only eight (8) teams attempted up to three (3) question; and only one (1) question was answered correctly by five (5) teams. The poor performance was adjudged to be due to both shortage of equipped laboratory for practical experiments; and the dearth of qualified and experienced lecturers. The research, among other things, recommends the provision of at least two hundred and fifty (250) PCs each for each computer laboratory of the Nigerian tertiary institution (Onibere, Osuagwu, Owolabi, Boukari, Onyekwelu & Bamodele,2009).But, given the current NEEDS assessment report of both the universities and the polytechnics, how many tertiary institutions in Nigerian can boost of one hundred (100) PCs in their computer laboratory today? |
| Aim and Objective(s) of the Study |
| In this research aims at developing a system that combines both virtual learning and virtual laboratory in a single platform. The performance of our proposed system will be measured on its ability to:   1. allow students to log into our web portal from their web-enabled mobile devices without internet charges; 2. allow student to undertake personalized learning on any of available programming courses; 3. provide interface for students to write and test programs in the selected course from their mobile device; 4. allow lecturers and technologist put up programming activities for students to engage in; 5. and allow students submit codes to their lecturers and technologist via this system. |
| Literature Review |
| Although most stakeholders, may attribute the bankruptcy in programming culture to funding, different authors have argued that poor funding cannot be used as the generic excuse to wish away this demeaning trend and so have suggested several alternatives to conventional learning and practical classes. Most of this works were either centered on e-learning or virtual laboratory.  In a study conducted by Jonah, Ayodele, Kehinde, Osasona, Ajayi (2009) a web-based laboratory was used in laboratory experiment for a semester course in electrical engineering with 235 students in attendance. When compared with performance of the students who used the conventional laboratory, it was discovered that the academic performance of those who were taught using the web-based ‘laboratory were higher than their counterparts who carried out the same practical in previous semesters using the conventional laboratory models. Also, the WBL provided the students with both the structure and the opportunity to be involved in the learning process.  Onyejegbu, et al (2009) combined the conventional classroom assessment and a learning portal to provide a web-based e-learning system that supports both synchronous and asynchronous learning. The research presents a blended method of learning that combines both Internet learning tools and the traditional class room assessment to ensure efficiency. Learning will be done online using either asynchronous or synchronous method; while the final assessment will be done in the classroom. Video streaming technology is used to provide the virtual classroom after which the student is examined with test questions. The activities of the student are monitored using the test results of the students and the log entries of the student’s activities. These monitored information, provide feedback for the student, the teacher and the system. Haven been implemented with c#, ASP.NET and MSSQL, the system is prone to challenges arising from proprietary license cost and platform incompatibility.  Chika and Chukwudebe (2009) proposed a virtual laboratory to aid students of electrical/electronic engineering construct and simulate electrical circuit. The system is implemented using Java, Spice Opus, MySQL, PHP and Netlist generator. Their web-based system runs in a client/server mode. The front-end consist of java applet that provides a GUI for the user and communicates with the server application using the RMI (Remote Method Invocation). The back-end consists of the server machine and the server applications, and the simulation software, Spice Opus. The students uses the GUI to simulate the circuit design; while the logs of students’ activities will be provided using watch-dog mechanism for the teacher to assess the student as well as determine the level of work covered by the student. Like other simulation tools like MATLAB, SIMULINK, MULTISIM etc, the system seeks to provide a simulation framework; but this time, at no extra cost. However, this system is limited to circuit designs. |
| Methodology |
| Object-Oriented Analysis and Design (OOAD) will be used for the analysis of the current system as well as the design of the proposed system.  Results from unstructured interview; observation of organizational processes; and examination of relevant documents shall provide the primary source of data for our chosen case study- Akanu Ibiam Federal Polytechnic Unwana- and to aid our analysis on the practice of traditional programming laboratory as portrayed in the procedure diagram.  Unified Modeling language will be adopted as a pattern for developing all the technical documentation needed for the systems development. This documentation will include data flow diagram (DFD), Use case diagram, class diagram and entity relationship diagrams (ERD).  Our proposed system will be implemented with some Open Source technologies. PHP will be used for developing the server-side processing; MySQL to store the tutorials at the back-end and users of the system; while HTML, JavaScript and CSS for the design of the user-interface at the front-end. The virtual laboratory and the tutorial materials will be hosted on a local server on a local network. The server will have virtualization software that will emulate the various programming language IDE that will be implemented. |
| Result (Expected Output Results) |
| The expected outcome and deliverables of this research will include:   1. A virtual learning portal: The system allows students to log into the web portal from their web-enabled mobile devices and go through tutorials on programming languages. 2. A virtual laboratory: Provide students to a coding environment to write and test programs in the selected programming language. 3. Complete Documentation of New System |
| Workplan Timeframe (Provide activity in the form of a GANTT chart) |
| This section shows the different tasks that will be carried out throughout the phases of this research, the duration of completing each task and the tasks that must be completed before handling another task. Figure 1 shows the Gantt Chart. |
| Budget (Provide a budget breakdown by the activity/line item) |
| The budget breakdown of all the step by step activities that will be involved in the entire research is shown below:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | S/No. | Description of Item | Quantity | Unit Price (N) | Total (N) | Remark | | 1 | Personnel Cost |  |  |  |  | | 2. | Eqipment and Test |  |  |  |  | | 3. | Transportation aanad Travel |  |  |  |  | | 4. | Other Indirect Cost |  |  |  |  | | 5. | Implementation and Training |  |  |  |  | | 6 | Documentation |  |  |  |  | |
| References |
| Allen, M. W. (2007). Designing Successful E-Learning. John Wiley & Sons, Inc: Pfeiffer, San Francisco USA.  Chika, I. E. and Chukwudebe, G. A. (2009). A Web-Based Virtual EE Laboratory With A Watch Dog Monitor For Improved Learning. . 9th International Conference and Annual General Meeting of Nigeria Computer Society. Proceeedings. Pp 347-353.  Jonah, O. P., Ayodele, K. P. Kehinde, I. O., Osasona, O. and Ajayi, E. O. B. (2009). Comparison Between A web-based laboratory (WBL) and Conventional Laboratory Models. The Journal of Computer Science and Its Applications. Vol.15 No.1, July, 2009. Pp 124-135  Koper, R. (2000). From Change to Renewal. Inuagural Speech Delivered at Educational Technology Foundations of Electronic Learning Environments. Open University of Neitherlands. Pp 1-41.  Onibere, E. A., Osuagwu, O. E. Owolabi, O., Boukari, S. , Onyekwelu, D. C. and Bamodele, O. J. (2009). The Sorry State of Computer Science Education in Nigeria University: Panacea for Disaster Recovery. The Journal of Computer Science and Its Applications. Vol.15 No.1, July, 2009. Pp 96-123.  Onyejegbu, L. N., Asor, V. E. and Ugwu, C. (2009). Implementation of A Hybrid Learning System. 9th International Conference and Annual General Meeting of Nigeria Computer Society. Proceeedings. Pp 333-336. |

Signature of Principal Researcher Signature of Chairman IRC

Signature of Head of Department Signature of Head of Institution

Principal Researcher: **CURRICULUM VITAE**

**NAME:** EZEORAH, EZEKIEL UCHECHI

Principal Researcher: Appointment letter (attach)

Principal Researcher: Confirmation of Appointment (attach)

Co-Researcher1: **CURRICULUM VITAE**

**NAME:** MADUBUIKE, CHIBUIKE EZEOCHA

**DATE AND PLACE OF BIRTH**: October 18, 1982 at Aba, Abia State

**NATIONALITY:** Nigerian

**STATE OF ORIGIN:** Abia

**POSTAL ADDRESS:** Department of Computer Science,

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**MARITAL STATUS:**  Married

**NUMBER OF CHILDREN:** Two

**INSTITUTIONS ATTENDED WITH DATES**

2014 – Date Ebonyi State University, Abakiliki

2011-2014 National Open University of Nigeria, Lagos

2004-2008 Michael Okpara University of Agriculture, Umudike

2001-2004 Akanu Ibiam Federal Polytechnic, Unwana

1997-2000 All Saints Secondary School, Aba

1994-1996 NINLAN Demonstration Secondary School, Aba

1988-1993 Ogbor Hill Primary School, Aba

**EDUCATIONAL QUALIFICATIONS:**

2014 Masters in Information Technology (second class, upper)

2008 Bachelor of Science in Computer Science (second class, upper)

2004 National Diploma in Computer science (Distinction)

2000 West African Examinational Council (WAEC)

**PREVIOUS EMPLOYERS/WORKING EXPERIENCE:**

**Mar. 2011- Date Lecturer at Akanu Ibiam Federal Polytechnic, Unwana, Afikpo**

**Mar. 2010- Jan. 2011 Maximum Insight Global Services, Port-Harcourt,**

92 Aba Road, Port-Harcourt

Position: Systems Engineer/ Certified Instructor,

Responsible for maintenance of the company’s systems; recovery of data from crashed hard disk and corrupt operating systems; systems optimization; training of students on Computer Appreciation, Comptia A+ and Networking

**Mar. 2009 – Feb. 2010 Teaching: Primary school, NYSC (Ussa LGA, Taraba State).**

**Jan. 2004- Oct. 2008 NED Consultants(SIWES /Part-time staff)**

Suite 106, 3 Azikiwe Road, Port-Harcourt

Position: Systems Engineer (Part-time)

Daily backup of client company’s Databases; Server Administration; Hardware Maintenance and Troubleshooting; Training of employees on the use of LoanPerformer (LPF) and QuickBooks

**SERVICE TO OTHER COMMUNITIES**

1. Chapter Software Director, National Association of Computer Science Students (NACOSS) Umudike, 2006/2007 session;
2. Chapter Equipment Manager, Christ Ambassadors Students’ OutReach (CASOR) Unwana, 2002/2003 Session;

**HOBBIES:**

Reading and programming

**REFEREES:**

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Resident Pastor,

Mountain of Fire and Miracles Ministries

Afikpo Zonal Headquarter

07066807024

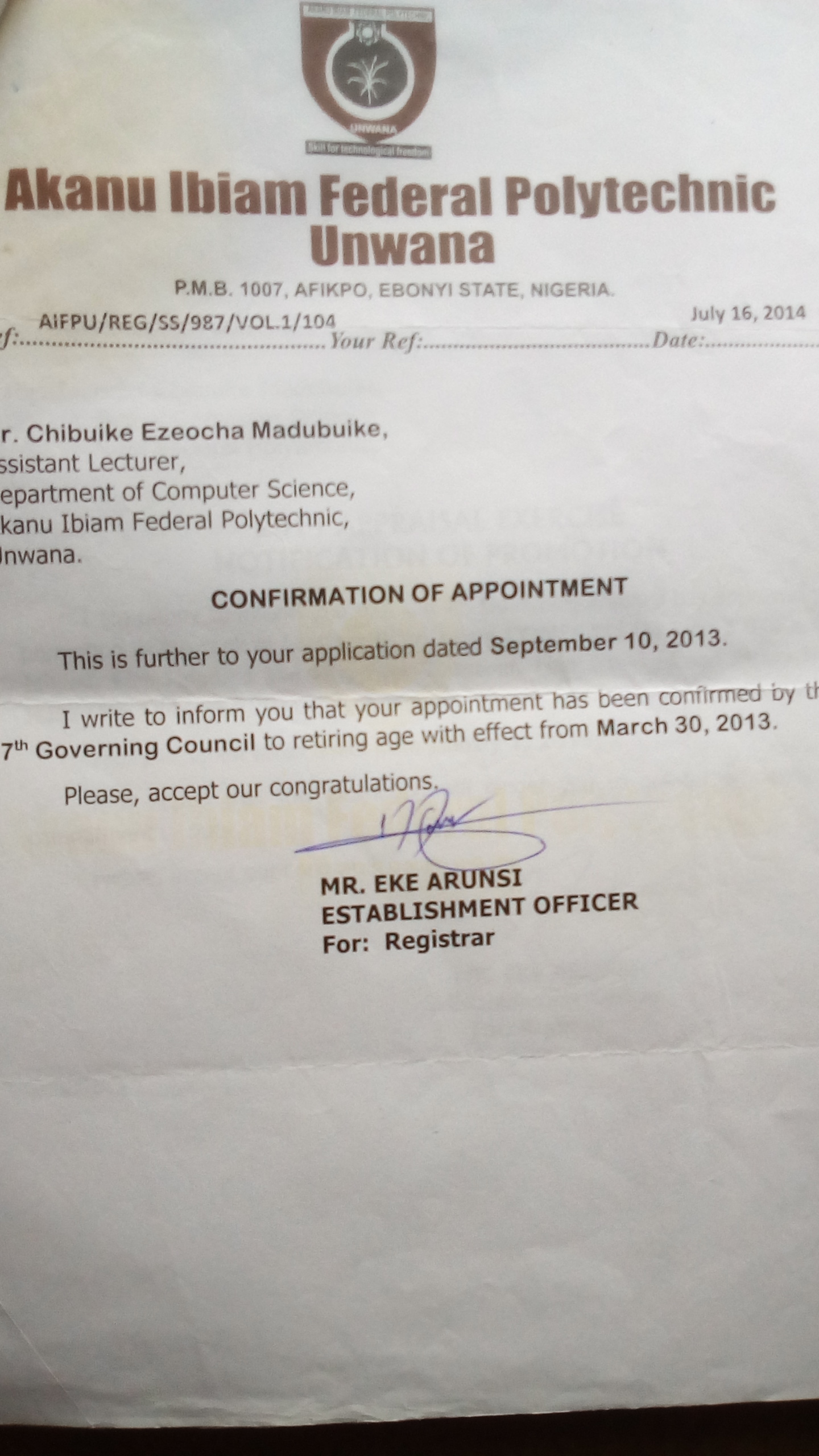
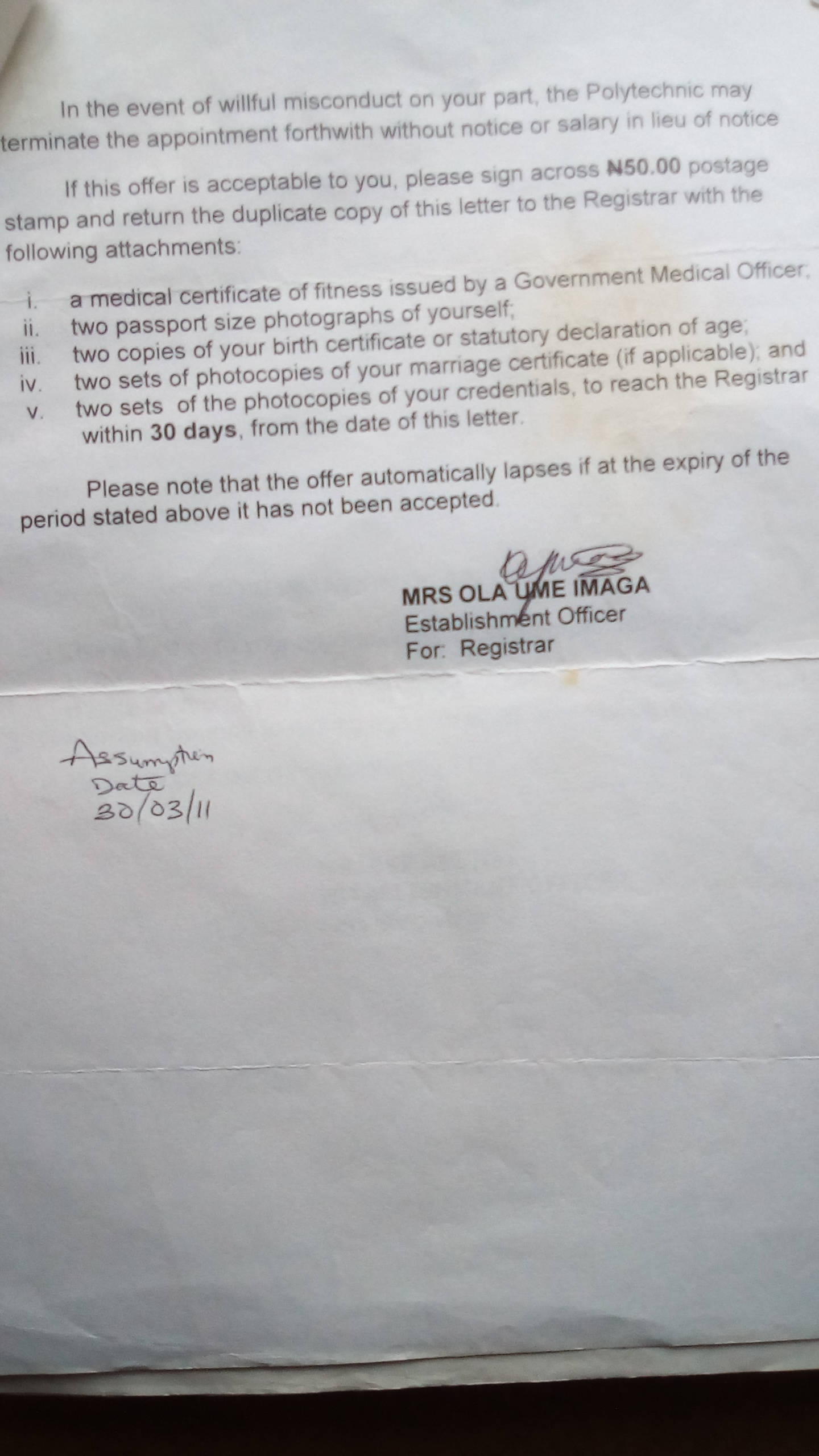
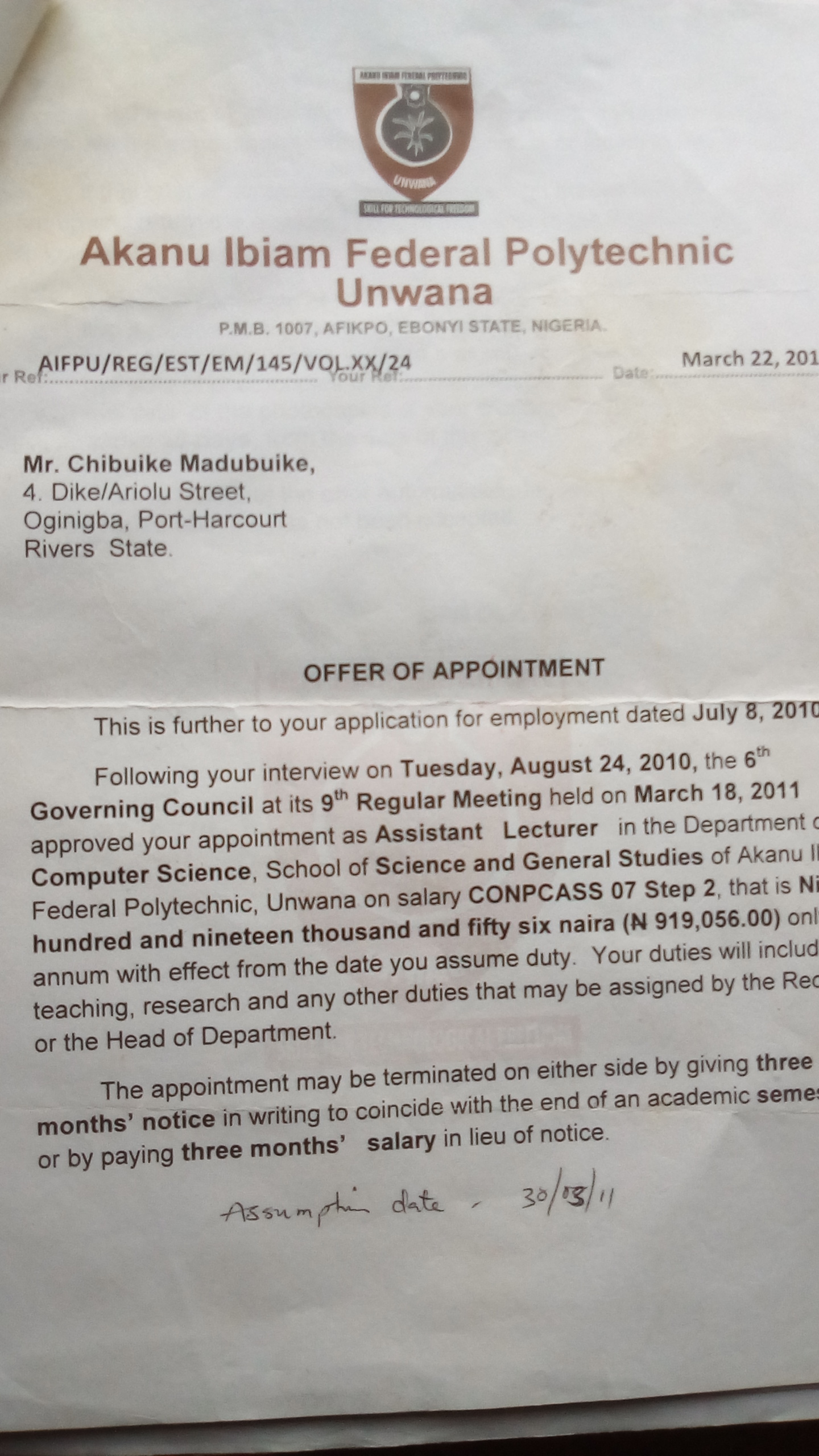
1. Prof. Mbam, Benedict

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Michael Okpara Uni. of Agric.

Umudike, Umuahia

07036597010



Co-Researcher2: **CURRICULUM VITAE**

**NAME:** ONUORA, AUGUSTINE CHIDIEBERE

Co-Researcher2: Appointment letter (attach)

Co-Researcher2: Confirmation of Appointment (attach)