BRIEF HISTORY OF THE FOUNDER

SHEIKH KHALIFA ISYAKU RABIU
KADIMUL QUR'AN

Khalifa Sheikh Isyaku Rabiu was born in the ancient city of Kano, in the year 1928 at Jingau quarters. His Parents were Sheikh Muhammad Rabiu and Hajiya Fadimatu. May their souls rest in Jannatul Firdaus.

Khalifa started studying the **recitation of the Holy Qur'an** under the guidance of his father from 1936 to 1942 when he had the traditional ceremony of completing the reading and learning of the Holy Qur'an.

Khalifa Sheikh Isyaku Rabiu proceeded further with his studies in Borno State (Maiduguri) where he completed the **memorization and recitation of the Holy Qur'an** in 1946.

Khalifa continued with the study of **Tasawwuf and Dariqa** under Sheikh Abubakar Mijinyawa at Bakin Ruwa Quarters, Kano. He later returned back to his father's school where he received the knowledge of **Quranic science recitation (Tajwid).** However, Khalifa Sheikh Isiyaku Rabiu subsequently transferred to Sheikh Abdullahi Salga's school at Sanka in the city of Kano, for him to study **Islamic Law, Hadith and Jurisprudence** where he graduated in 1949.

After graduation from Sheikh Abdullahi Salga's school his father gave him permission to start a business, where he started **trading in Kurmi Market** in 1949. In February 1952 Khalifa registered his business as a company called **Isiyaku Rabiu and Sons Limited**.

As time went on in 1973, Khalifa changed the company name to **Isiyaku Rabiu Group Of Companies** a conglomerate of twelve companies dealing in Trading, Manufacturing, Insurance, Banking, Aviation and Real Estate with over 1000 employees. Khalifa Sheikh Isiyaku Rabiu was the **Chairman and Chief Executive officer** of Isiyaku Rabiu & Sons Ltd, Kano Vehicle and

Accessories Ltd, Bagauda Textile Mills Ltd, Rabiu Bottling Company Ltd, Kano Suit and Packing Cases Factory Ltd, IRS Rice Mills Limited, IRS Airlines Limited, Afro Sacks Nigeria Limited, Kano Sugar Industries Limited and Combined Services Nigeria Limited.

In 1969 Khalifa and some other Businessmen in Kano established the First indigenous trading company, **Kano Merchants Trading Company** which later switched to **Bagauda Textile Mills Ltd.** He also played active role in the establishment of companies like, Nigerian Victory Assurance Company, Stanbic Merchant Bank Nigeria (first Chairman), Habib Nigeria Bank Limited, Giwarite Nigeria Limited and Combined Services Nigeria Limited.

Khalifa Sheikh Isiyaku Rabiu was a **Director in many other companies** across the nation and other countries and was also a **Member, Governing Council** of University Of Ibadan, Islamic University of Niger, Niamey, International University of Africa, Khartoum Sudan, Senate Member, Faisal University, Njamena, Chad, Member, Organisation of Islamic Conference Saudi Arabia, Member, Muslim world league, Saudi Arabia. And also a member of its committee on Mosques, Member Council of Ulama, Nigeria.

Sheikh Isiyaku Rabiu was appointed as **leader of the Tijjaniyya Movement** in Nigeria and the neighboring countries in 1994, and also gained the title of **'KHALIFA'**. He was the **President of Sheikh Muhammadu Rabiu Islamic Foundation International**, an Islamic organization for both humanitarian and Islamic propagation.

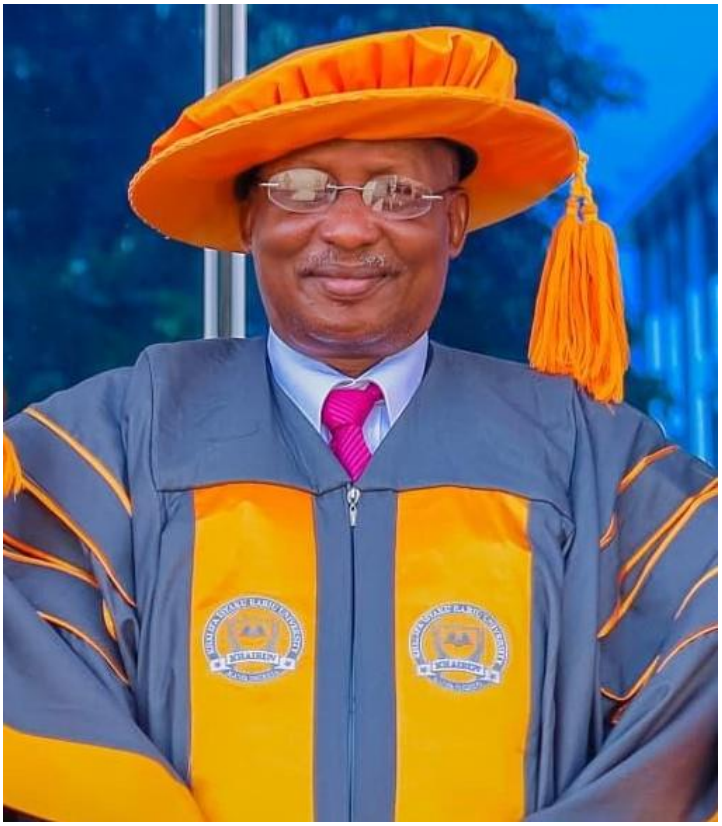
Khalifa received **Award of Men of Achievement** in 1991 by the Cooperate Press Services Ltd, Lagos and Kano State Government Sports Award, the Industrial Giants Merit Award in 1998, Ahmadu Bello International Award In 1999 and also honoured with the **Order of the Federal Republic (OFR)** during the government of president Olusegun Obasanjo, in recognition of his contributions in uplifting the standard of living in his community and the nation at large. And so many other awards.

He is just the one single person in history of Kano, and the Northern Nigeria in Nigeria that has succeeded in the establishment of Private schools from kindergarten to university level. May his gentle soul continue to rest in Jannatul Firdaus.

Chancellor and Principal Officers of the University

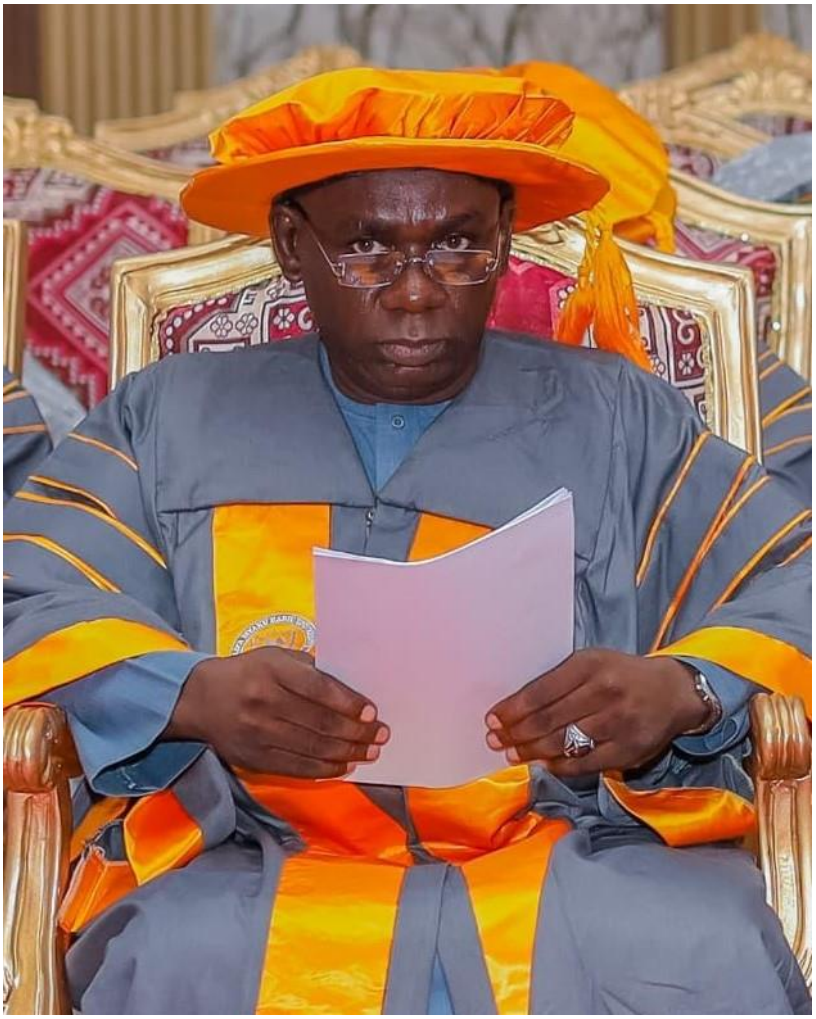
CHANCELLOR
Alhaji Samaila Mohammed Mera (CON)
Emir of Argungu

PRO-CHANCELLOR
Prof. Kabiru Isyaku OON, FNAE, mni



VICE-CHANCELLOR

Prof. Abdulrashid Garba, *PhD; fcasson; mnae, icasson*



REGISTERAR

Malam Yusuf Datti

BURSAR

Dr. Najaatu Bala Rabiu CNA, ACTI,

UNIVERSITY LIBRARIAN
Nazir Muhammad, CLN, MNLA

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INTRODUCTION TO STUDENTS' HANDBOOK

In the year 2022, the National Universities Commission (NUC) announced an addition of a new private university in Kano State. That was the proclamation of the Khalifa Isyaku Rabiu University, Kano. The University's acronym is KHAIRUN. The Founder of the University, was Khalifa Isyaku Rabi'u (Khadimul Qur'an), *rahimahulLah*. Until his *wafat* he demonstrated keen interest and desire to witness the completion of his long standing ambition of building an educational empire, from Kindergarten to the University level. Allah (SWT) in His infinite mercies did not plan for that. In His divine wisdom, Allah SWT has however, blessed the worthwhile ambition of this gentleman - today, KHAIRUN is a reality. It is an addition to the various schools he has established from the scratch. May Allah SWT continue to rest his gentle soul in Jannat el-Firdaus.

Presently, KHAIRUN has three Faculties, ten Departments and sixteen academic programmes, namely: Allied Medical Sciences with three Departments and three programmes; Science and Computing with five Departments and ten programmes; and Engineering with two Departments and three programmes. Each of these programmes has been equipped with state of the art equipment in classes and in the laboratories. In addition to all these there are smart

classrooms for easy tutelage, strong internet access, and a vibrant website. The University Library is well equipped with current holdings and e-resources. There is also a well-equipped hostel facility for both male and female, and for international students. All these are provided for students in order to ease academic pursuit.

While we remain prayerful for Allah's protection, the University has provided adequate security measures to protect lives and properties, and against any incursion by insurgent elements. To crown all these, the University has a well-planned arrangements on ground to ensure strict compliance to all University regulations, social norms and values, and for the observance and enforcement of our highly cherished Islamic traditions. Staff and students are therefore encouraged to be wary of, to support and be ready to imbibe the peculiarities of KHAIRUN environment.

I want to, on behalf of Proprietors, Board of Trustees, Governing Council and Management of KHAIRUN, welcome all the newly admitted students to this promising citadel of learning. I also wish to congratulate you for the single advantage and rare privilege of being pioneer students.

Abdulrashid Garba, *PhD; fcasson; mnae, icasson*
Vice-Chancellor

The University Logo

The Logo is circle in shape containing a book and a pen embossed on brown strip. The book and pen depicts hallmark of knowledge. The brown colour represents soil from which life began; on to which the resources for sustaining life on earth exist; and into which life shall end. This signify that the University emphasizes knowledge and its translation into real life applications guided by code of ethics that leads to good ending. The writing printed in the Logo's upper semicircle is the name of the **Founder** of the University.

Khalifa Isyaku Rabiu

This represents an exemplary life of commitment, dedications, hardwork and sacrifice in the service to humanity, worthy of emulation by students and staff of the University.

Motto

"Functional Education is Light"

The University is dedicated at producing total person with the requisite skills, knowledge and values relevant to the 21st century.

The University Colour (Orange and Ash)

The **Orange,** as a blend of red and yellow is associated with energy and happiness that boosts aspirations, stimulates mental activity and enhances confidence and understanding. Thus, the University emphasize to stimulate its students to attain utmost capabilities in their educational pursuits.

The **Ash** characterizes transparency which portrays the uniqueness of the colour. It is sometimes equated with grey and can be used for font colour, headers, graphics, and even products to appeal to mass audience. KHAIRUN's stunning façade is decorated in soft ash and its variations

Vision

The vision of the University is to be a World-Class teaching and research University, producing educated,

self-discipline, confident and independent minded graduates (Character and Learning)

Mission

The mission of the University is to produce educated, morally sound and skilled graduates that will respond to the Challenges of 21st century

Philosophy Goals and Objectives

The University will embrace openness in the pursuit of knowledge and will welcome intellectually restless students, who use their talents to put ideas to test. Education in the University will not be viewed only as a gateway to personal development but also as a pathway to improve society. The University will strive to help students develop knowledge, appreciation, understanding, ability and skills which will prepare them for responsible living in a complex World

The university has a faith-based philosophy presupposes the integration of faith and learning. The university is prepared to invest the time necessary to prepare students intellectually and spiritually to be productive citizens in the 21st century. The students will be assisted to reach their highest potentials.

Goals and Objectives

a) Encourage the advancement of learning and to hold out all persons without distinction of race, creed, sex or political conviction the opportunity of acquiring a higher and liberal education;

b) Provide resources for instruction and other facilities for the pursuit of learning in all its branches, and to make those facilities available on proper terms to such persons as are equipped to benefit from them;

c) Encourage and promote scholarship and conduct research in all fields of learning and human endeavor;

d) Evolve academic programmes to suit the changing social and economic needs of the society through continuous review of curricular and development of new programmes through programme structural flexibility to respond to societal technological changes;

e) Create and expand access and opportunities for education, attract and retain quality students, researchers, teachers, and other academic and non-

academic staff thereby assisting in developing human capital development and mitigation of the brain drain currently afflicting Nigeria;

f) Produce internationally acceptable graduates that would compete favorably with their peers anywhere in the World;

g) Cary out basic and applied research leading to the domestication and application of new technology to the Nigeria context through collaborative linkages with other academic and research institutions in Africa and the rest of the world;

h) Establish a center for entrepreneurial studies to stimulate job creation and innovative capacity in students from onset of their studies, in such a way that graduates shall be resourceful, self-reliant and job creators; and

i) Undertake other activities appropriate for teaching and community service as expected of a University of high standard.

Academic and Official Costume

The official costume for academic ceremonies will be in line with university academic colours (Ash, Dark Ash and Light Ash)

Faculty	Colour	Meaning
Allied Medical Science (FAMS)	Red	energy, strength and power

AUTHORITIES OF THE UNIVERSITY

The University Authority are the Proprietors, Officers of the Board of Trustees, the Council, the Senate, Faculty Board, the Congregation and Convocation.

Proprietor

The proprietor of KHAIRUN is the Muhammad Rabiu Islamic Foundation International responsible for the appointment of Board of Trustees.

Board of Trustees

Board of Trustees is the highest governing body of the University charged with the overall policy direction and financing of the University.

Council

Council is another governing body appointed by Board of Trustees which is charged with general management of the affairs of the University, and in particular, the control of the property and expenditure of the University. The membership of the Council consist of the Pro-Chancellor, Vice-Chancellor and representatives of the senate, congregation, convocation NUC, interest groups, Kano State government, proprietor's nominee and the Registrar.

Senate

The senate is responsible for the organization and control of admission, teaching, and discipline of students and promotion of research at the University. The membership of the senate consist of the Vice-Chancellor, University Librarian, Dean of faculties, including Dean, Student Affairs, Directors of academic centers, Heads of academic departments, Director academic planning, all Professors of the University, one elected from each faculty not below the rank of senior lecturer, and the registrar who shall be the secretary.

Faculty and Departmental Administration

Faculties shall be the center of teaching and research. It is directly responsible for the control of teaching, examination and evaluation of students. Each faculty should have faculty board while a department shall have departmental board. The Dean and Head of department shall handle the administration of the faculty and the department respectively.

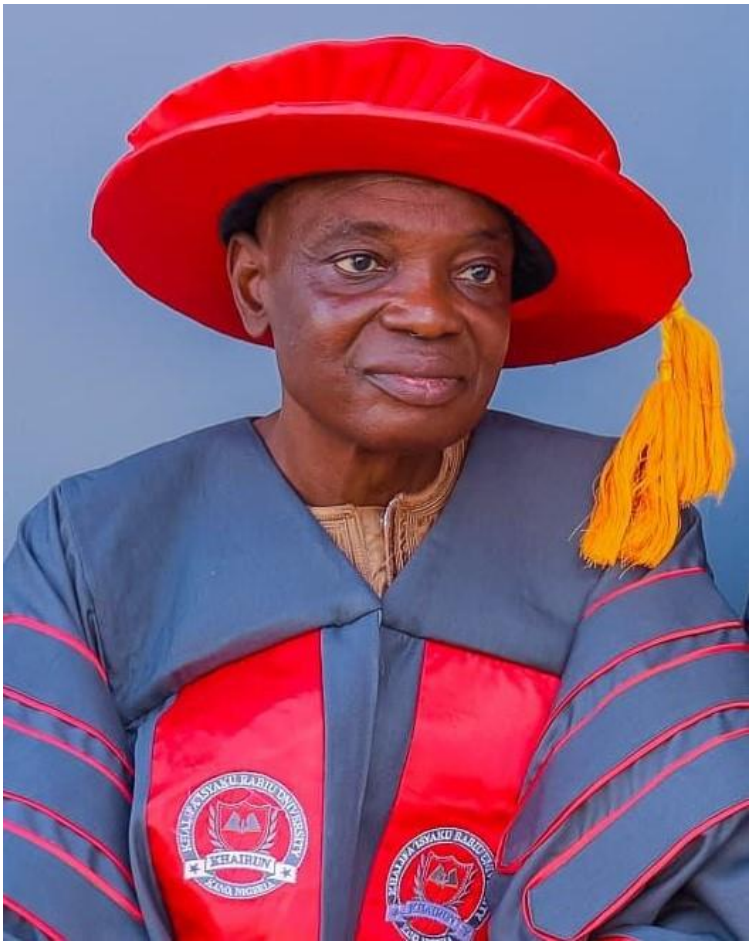
Congregation

The congregation provide an opportunity for members to meet and express their views on all matters affecting the interest and welfare of the University and its members. Members consist of all academic staff and non-academic staff holding degree conferred by recognized universities or any other qualifications recognized by the University.

Convocation

The convocation shall have the functions of awarding certificate, diplomas and degree, both undergraduate and post graduate of the University. Members consist of Pro-Chancellor and chairman of council, Vice-Chancellor, University Librarian, Bursar, registrar, all full time academic staff, and graduate of the University

FACULTY OF ALLIED MEDICAL SCIENCES



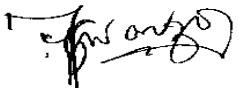
Prof Muhammad Yalwa Gwarzo PhD. FWACMLS
Dean Faculty of Allied Medical Sciences

FOREWORD

On behalf of the Faculty of Allied Medical Sciences, I wish to extend a warm welcome to you and offer my congratulations for securing admission into our prestigious university, as it reflects your success in a competitive selection process. Hence, you should work hard to consolidate the success in order to achieve the desired goal of graduating with good result, a prequisite for success in the competitive labour market. It is pertinent to note that success in graduation is not only dependent on hardwork, but also strick adherence to the rules and regulations of the University. The Faculty staff members are your friends, teachers and guides, thus they will strive to provide guidance and conducive environment for learning. The University handbook provides you with guidance for your stay during the course of study in the University and necessary information on the curricula of programmes in the Faculty. Currently we have three Departments in the Faculty viz: Medical Laboratory Science, Nursing Sciences and Medical Radiography. Earning a degree in any of the programmes will be a gateway for you into the exciting world of Health Care provision. I wish you

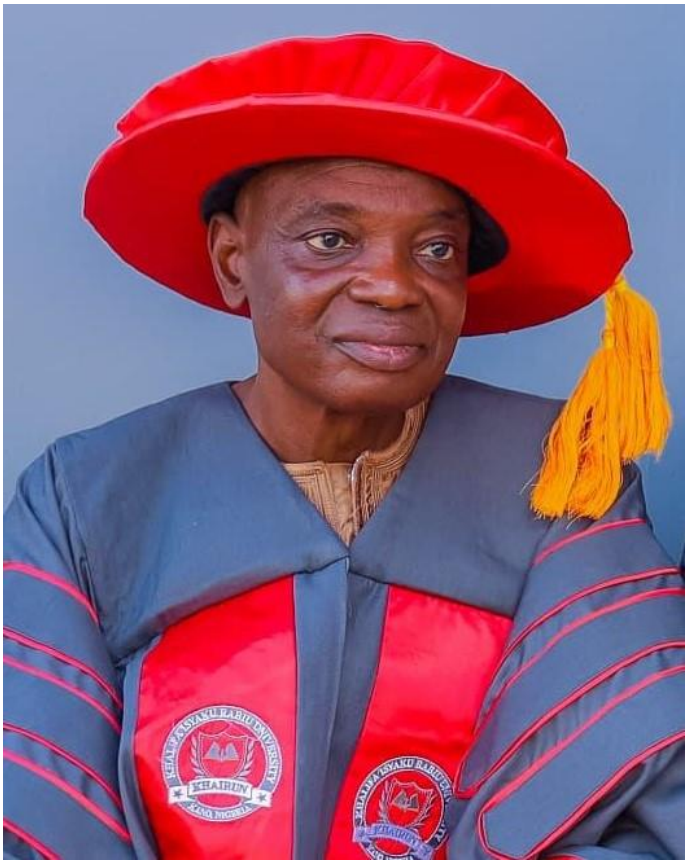
successful academic and professional pursuit in the Faculty.

Best Wishes



Prof Muhammad Yalwa Gwarzo PhD. FWACMLS
Dean Faculty of Allied Medical Sciences

HEAD, DEPARTMENT OF MEDICAL LABORATORY SCIENCE



Prof Muhammad Yalwa Gwarzo PhD. FWACMLS

PREFACE

This Handbook is a guide on policies and procedures in the Department to our Medical Laboratory Students. The University Handbook highlights in detail the general academic conducts, health and social activities in the University.

The establishment Degree programme in Medical Laboratory Sciences in the University was informed by the need of the nation's health care system to provide efficient health delivery, through accurate, reliable and timely diagnosis to the client. It also affords preparedness for novel scientific clinical research and medical advancement; thereby providing greater competence in the practice of laboratory medicine. The programme encapsulates the philosophy of the University of delivering innovative, responsive and learner-centered educational training.

The role of trained professionals in diagnosis, treatment and management of patients cannot be over-emphasized, as an estimated 75% of medical informed decisions rely on the interpretation of laboratory results. The medical laboratory management content of the programme, which gives emphasis on quality management system, makes graduates of the programme versatile so as to participate in other scientific endeavours outside the hospital. Such endeavours include, but not limited to research, biomedical,

pharmaceutical and forensic laboratories. Students during undergraduate training can specialize in any of the quasi specializations:- haematology, medical microbiology and parasitology, chemical pathology histopathology and immunology .

The profession of medical Laboratory Sciences is regulated by Medical Laboratory Science Council, a professional body saddles with the mandate of determining the level of knowledge and skills one needs to acquire to qualify as a medical laboratory Scientist. A Medical laboratory scientist must have a profound knowledge of basic clinical sciences, in order to provide services in clinical research and healthcare delivery. Since science is dynamic, hence the profession is ever evolving, as such, continuing education is imperative after graduation. A qualified medical laboratory scientist is to perform, develop, evaluate, correlate, assure accuracy and validity of laboratory result. Medical Laboratory practitioner has the responsibility of evaluating laboratory resources and operations; with diverse multi-factorial functions, such as assessing the principles, methodologies, performance of assays; problem-solving; troubleshooting techniques; interpretation, evaluation of clinical procedures and results; statistical approaches to data evaluation; principles and practices of quality assurance/quality improvement. It also includes continuous assessment of laboratory services for all major areas practised in the

contemporary clinical laboratory.

It is expected of Medical laboratory scientists to possess the perquisite managerial skills for financial accountability, operation, marketing and management of human resources. As independent professional, Scientists are solely responsible for their actions as defined by the act of National assemble establishing the regulatory board. However, as part of the health team, collaboration is necessary to provide qualitative healthcare.

Earning a degree Medical Laboratory Science will be a gateway for you into the exciting world of medical Laboratory Science. Hoping that such enthusiasm in medical laboratory science will be reinforced after reading this handbook. Finally on behalf of the academic staff of the Department, I wish to extend a warm welcome to you to the Department of Medical Laboratory Science, Maryam Abacha American University of Nigeria. I wish also to extend my congratulations to you for securing admission to our university, as it reflects your success in a competitive selection process.

Best wishes,

Prof Muhammad Yalwa Gwarzo Ph.D FWACMLS

Head of Department

FACULTY OF ALLIED MEDICAL SCIENCES

The Faculty of Allied Medical Sciences is among the take-off faculties with Professor Muhammad Yalwa Gwarzo as its pioneer Dean. The faculty, which started in the 2022/2023 session has three (3) departments for the moment.

Programmes and Degrees

The programmes are **Allied Medical Sciences** which covers the following degree areas.

Table 1: List of Programmes and Degree

S/N	Programme	Degree(s) in view
1.	Medical Laboratory Science	BMLS
2.	Nursing Sciences	B.N.Sc
3.	Radiography	B.Rad

Duration

The duration of first degree programmes is normally ten (10) semesters in the faculty of Allied Medical Sciences. Where a student fails to graduate at the minimum time, he may be allowed a maximum of half the duration of his degree programme over and above the stipulated time. Any period of approved suspension of studies shall not be counted. A student accepted on transfer shall spend a

minimum of two sessions in the University before graduation.

Mode Entrance

S/N	Mode of Entrance	Potential Level	Duration			
			Minimum		Maximum	
1	UTME	1	Year	Semester	Year	Semester
			5	10	7	14
2	DE	2	4	8	6	12

Mission

To provide qualitative training in professional, research and community services under the most conducive atmosphere in line with the University philosophy.

Vision

To be a centre of excellence in teaching, research and community service in the field of Medical Laboratory Science.

Philosophy

The broad philosophy of training in medical laboratory sciences are to Provide sound academic and professional background for the production of Medical Laboratory Scientists who would be capable of working anywhere in Nigeria. It is also aimed at producing Medical Laboratory Scientists who would satisfy internationally recognizable standards and who could undertake further

training towards specialisation and Medical Laboratory Scientists with sufficient management ability to play a leadership role and entrepreneurship in employing others, establishing self, and also in training and general practice of laboratory sciences.

Objectives

The objectives of the bachelor honors degree programme in Medical Laboratory sciences are to:

1. Provide sound academic and professional background for the production of Medical Laboratory Scientists who would be capable of working anywhere in Nigeria;

2. Instill in students a sense of enthusiasm for the profession; an appreciation of its application in different contexts (in areas such as general medicine, food and beverages, pharmaceutical industries, utility departments such as water corporations; research institutions and many others);

3. Involve the students in an intellectually stimulating and satisfying experience of learning, studying and research;

4. Provide students with a broad and balanced foundation of medical laboratory knowledge and practical skills; performing effectively in clinical

diagnostic services, academics and quality assurance; and function independently or in collaboration with other members of the health team in the care of individuals and groups at all levels of health care;

5. Develop in students, the ability to apply their medical laboratory knowledge and skills to the solution of theoretical and practical problems in laboratory medicine;

6. Develop in students through an education in medical laboratory sciences, a range of transferable skills of value in medical and non-medical employment;

7. Provide students with a knowledge and skills base from which they can proceed to further studies in specialized areas involving medical sciences;

8. To generate in students, an appreciation of the importance of medical laboratory sciences in an industrial, economic, environmental, health and social context;

9. Generate students with the ability to produce biological and diagnostic reagents as well as being able to fabricate and maintain laboratory equipment; and

10. Empower graduates of Medical Laboratory Sciences with skills that will enable them engage in income yielding ventures.

Unique Features of the Programme

1. The BMLS curriculum aims at training a Medical Laboratory Scientist with an area of specialisation in the subject area thus graduating with quasi specialisation at the first-degree level.

2. Final year BMLS students specialising in the 6 core departmental areas of Medical Laboratory Science take different parallel courses.

Admission and Graduation Requirements

The modes of entry are UTME and Direct Entry. To be admitted into the B.MLS programme the candidate must meet these entry requirements.

Admission Requirements

The B.MLS degree programme shall run for 5 years for Unified Tertiary Matriculation Examination entry candidates and 4 years for Direct Entry candidates.

Five-Year Degree Programme:

In addition to appropriate UTME scores, five Senior Secondary Certificate (SSC) (or its equivalent) credit passes including Mathematics, Physics, Chemistry,

Biology and English Language in not more than two sittings.

Direct Entry (DE)

Candidates of Allied Health Science disciplines with B.Sc in Biochemistry, Anatomy, Physiology, Microbiology, Zoology, and candidates with GCE 'A' level with minimum of credit passes in Biology, Chemistry and Physics in addition to the above Senior Secondary Certificate (SSC) credit passes, may enter the Programme at 200 Level. Holders of Medical Laboratory Technician (MLT) certificate of the Medical Laboratory Science Council of Nigeria who have at least five Senior Secondary Certificate credit passes in Physics, Chemistry, Biology, Mathematics and English Language (WAEC, NECO and NABTEB) at no more than 2 sittings are eligible for direct entry at 200 level. The medical laboratory technician already has an appropriate academic knowledge and skill in Medical Laboratory Science.

The B.MLS degree programme shall run for 5 years for UTME entry candidates and 4 years for Direct Entry candidates. The pass mark for core courses is 50%. The degree is an unclassified degree.

General Regulations of the Programme

The BMLS programme is an integrated professional course, leading to the award of Bachelor of Medical

Laboratory Science (BMLS) following NUC and Medical Laboratory Science Council of Nigeria Guidelines. The study of the integrated professional program shall generally be for a minimum of five academic sessions.

- The maximum period of study permissible for the BMLS program shall be seven (7) academic sessions for UTME candidates and six (6) academic sessions for Direct Entry candidates.

- The minimum credit load registered per semester is 14 credit units, while the maximum load is 25 credit units with the exception of level 400.

- Instruction is by course, specified into course units.

- During the laboratory posting, the logbook must be certified by qualified medical laboratory scientists and endorsed by the head of the Department. A passing grade of C at each posting is essential for graduation.

Progression from One Level to Another

Progression from 100 to 200 Level

Candidates must pass Chemistry, Physics, Biology, and Mathematics courses offered in level 100.

i. **Resit:** A candidate who fails one (1) or two (2) subject(s) will be recommended to resit the failed courses within the subject
ii. **Repeat:** A resit candidate who fails any of the resit examination will be recommended to repeat the level 100, provided that the candidate is not repeating the level.
iii. **Withdrawal I:** A candidate who fails more than two (2) subjects will be recommended for withdrawal
iv. **Withdrawal II:** Withdrawal applies to a repeating candidate that qualified for another repeat

Progression from 200 to 300 Level:

Candidates must pass a total number of credits of the registered courses at level 200.

i. **Re-sit:** A candidate who fails not more than 1/4th or 25% of courses/credits registered, he or she would be recommended to re-sit.
ii. **Repeat:** A candidate who fails more than 1/4th or 25% but not more than ½ or 50% of courses/credits would be recommended to repeat the level.
iii. **Withdrawal I:** A candidate who fails the repeat class would be advised to change to a relevant programme or advised to withdraw.
iv. **Withdrawal II:** A candidate who fails more than ½ or 50% of courses/credits would be recommended to switch from the programme to

another relevant programme or advised to withdraw

Progression from 300 to 400 Level:

A candidate must pass all courses at level 300 before proceeding to level 400.

i. **Re-sit:** A candidate who fails not more than 1/4th or 25% of courses/credits registered, he or she would be recommended to re-sit.

ii. **Repeat:** A candidate who fails more than 1/4th or 25% but not more than ½ or 50% of courses/credits would be recommended to repeat the level.

iii. **Withdrawal I:** A candidate who fails the repeat class would be advised to change to a relevant programme or advised to withdraw.

iv. **Withdrawal II:** A candidate who fails more than ½ or 50% of courses/credits would be recommended to switch from the programme to another relevant programme or advised to withdraw.

Progression from 400 to 500 Level:

A candidate must pass all courses at the 400 level before proceeding to the 500 level

i. **Re-sit:** A candidate who fails not more than 1/4th or 25% of courses/credits registered, he or she would be recommended to re-sit.

ii. **Repeat:** A candidate who fails more than 1/4th or 25% but not more than ½ or 50% of courses/credits would be recommended to repeat the level.

iii. **Withdrawal I:** A candidate who fails the repeat class would be advised to change to a relevant programme or advised to withdraw.

iv. **Withdrawal II:** A candidate who fails more than ½ or 50% of courses/credits would be recommended to switch from the programme to another relevant programme or advised to withdraw

v. Repeat waiver: A candidate at the clinical (400 and 500 Levels) who could not perform to proceed to next level or graduate from the programme will be allowed to repeat the level without limit to enable to student maximum chance of graduating

Criterion for Placement into Various Specialties

Students are placed into respective specialties based on choice and performance in the departmental core courses of 400 level (Chemical Pathology, Haematology, Histopathology, and Medical Microbiology)

Conduct of Examination

Students will only be admitted for examination upon satisfying, the payment of school fees and registration for the course to be examined with at least 75%

attendance in lectures, laboratories, clinics and field practicals. These requirements for admission into examination may be reviewed by the university management from time to time and such changes will be communicated accordingly to students at the start of a new session. It shall be the responsibility of students to ensure their registration for the appropriate examinations, know the dates, times and venue of the examination.

Discipline During Examination

It is mandatory for students to be at the examination room at least thirty minutes before the time of examination. They should also ensure the supply of pens, pencils, rulers, etc. Under no circumstances should students bring papers of any kind into the examination hall. It should be noted no extra time will be awarded to students admitted forty–five minutes after the start of the examination.

It will also be at the discretion of the invigilator to accept student who reports more than forty-five minutes after the start of the examination if good reasons for lateness are valid and plausable. However, the circumstances under which the Invigilator admitted students after 45 minutes to the commencement of the examination should be reported to the Faculty Examination Officer who shall advise the Board of

Examination on whether to accept or reject the student's paper.

Permission can be granted by Invigilator for student to leave examination room provided:

a. Scripts are handed over to the Invigilator before leaving.
b. Such request is not made during the first hour or last fifteen minutes of the examination.
c. No readmission shall be entertained except:
    i. Under continuous observation and supervision of the Invigilator.
    ii. If accompanied by authorized person to answer the call of nature

Students admitted for examination must observe the following:

i. Display Identification card at all time in a position which it can sighted.

ii. Each student shall signing of attendance form with matriculation or examination number, name and signature. Each student must also sign out after submitting his/her answer script by signing the appropriate column of the attendance register.

iii. No discussions of any sorts during examination.

iv. Unauthorized aids such as handset and computers should be taken into an examination room.

v. No books, paper or similar matters are admitted into the examination Hall.

vi. Personal belonging such as handbag, briefcase handset must be deposited at approved designated place provided for that, before the commencement of examination.

vii. No cross talking among students, noise or disturbance, except to the Invigilator for the purpose of asking question or permission for certain actions.

viii. No assistance directly or indirectly shall be render to any another student, nor shall he/she accepts such gesture.

ix. All rough work must be done on the answer booklets, which can be neatly crossed as use of scrap paper is not permitted.

x. No mutilation of material provided for examination.

xi. Examination number must be distinctively written on the space provided on the answer booklet or separate paper. Under no circumstance should a name of a student written on the answer booklet of extra sheet of paper provided.

Disciplinary actions during the conduct of examination

Any student suspected or found to be infringing any of the provisions above shall be reported to the Departmental Examination and Disciplinary Committee to initiate the cascades of disciplinary process. At each level of process, thorough investigation will be carried out, in which students are given fair hearing. The student concerned shall be allowed to continue with the examination provided he/she causes no disturbance.

External Examinations

The first professional and the final examinations shall be moderated by external examiners following existing examination regulations of Maryam Abacha American University of Nigeria. Furthermore, all academic examination of core courses to the profession must be moderated by a Professional senior academics and in line with examination regulations of Maryam Abacha American University of Nigeria.

Internal Examinations

For each course, a candidate must attain 75 percent attendance at lectures, practical's, and clinical laboratory posting to be eligible for the examination

The pass mark is 50% for all courses, including computer. However, exception is made for GSP and level 100 courses, where 40% is the pass mark.

• **Grading of Courses**: The mark obtained in each course shall be assigned the appropriate letter grades as follows: If a candidate passes a resit, he/she will obtain a maximum of 'C' grade that is 50%, irrespective of their score.

Final Year Student Research Project:
Final year students are required to write a research project and submit three (3) bound copies of the research project at a date not later than four (4) weeks after the second semester examination.
The external examiner shall also moderate the grading of the projects

Marks	Letter Grade	Grade
≥70	A	5
60-69	B	4
50-59	C	3
< 50	F	0

Global Course Structure

Preamble

Courses shall be provided leading to the degree of Bachelor of Medical Laboratory Sciences which may be awarded to students who have successfully fulfilled all academic requirements. The training shall be a combination of teacher-directed, tutor-guided, self-learning and problem-based methods. Courses shall be provided leading to the degree of Bachelor of Medical Laboratory Sciences which may be awarded to students who have successfully fulfilled all academic requirements. The training shall be a combination of teacher-directed, tutor-guided, self-learning and problem-based methods.

100 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian People and Culture	2	C	30	-
BIO 101	General Biology I	2	C	30	-
BIO 102	General Biology II	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
BIO 108	General Biology Practical II	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM 108	General Chemistry Practical II	1	C	-	45

Course Code	Course Title	Unit(s)	Status	LH	PH
COS 101	Introduction to Computing Science	3	C	30	45
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
MTH 101	Mathematics for Health Sciences	3	C	45	-
Total			**28**		

200 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	30	-
ANA 203	General and Systemic Embryology	2	C	30	-
BCH 201	General Biochemistry I	2	C	30	-
BCH 203	General Biochemistry Practical	1	C	-	45
ANA202	Histology of Basic Tissues	2	C	15	45
MCB 201	Introduction to General Microbiology	2	C	30	-
MLS 201	Introduction to Medical Laboratory Science	2	C	15	45

Course Code	Course Title	Unit(s)	Status	LH	PH
PIO 201	Introductory Physiology and Blood	2	C	30	-
PIO 203	Physiology of Excitable Tissues	2	C	30	-
ANA 201	Anatomy of Upper and Lower Limb	2	C	15	45
BCH 202	General Biochemistry II	2	C	30	-
PIO 214	Introduction to Cardiovascular and Respiratory Physiology	2	C	15	-
PIO 216	Gastrointestinal Physiology	2	C	15	45
STA 201	Biostatistics	2	C	30	-
MLS 201	History of Medical Laboratory Science	2	C	30	---
MLS 202	Introduction to Biology of Diseases	2	C	15	45
Total			**33**		

300 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
MLS 302	Basic Haematology	2	C	15	45
MLS 303	Basic Microbiology	2	C	15	45
MLS 304	Basic Histopathology	2	C	15	45
MLS 301	Basic Clinical Chemistry	2	C	15	45
MLS 307	Practical Exercise I	2	C	15	45
MLS 305	Basic Immunology	2	C	15	45
MLS 306	Laboratory Posting I	2	C	15	45
MLS 308	Fundamentals of blood group serology	2	C	15	45

MLS 309	Basic Medical Parasitology and entomology	2	C	15	45
MLS 310	Biomedical Engineering	2	C	15	45
PHA 301	Basic Pharmacology &Toxicology	2	C	15	45
BCH 304	Chemistry and Metabolism of Amino acids and Proteins	2	C	30	-
MLS 301	Molecular Biology and Microbial Genetics	2	C	15	45
MLS 302	Forensic Science	2	C	15	45
MLS 303	Medical Laboratory Bio-risk Management	2	C	30	--
MLS 304	Bio-manufacturing and Invitro-diagnostic Reagents	2	C	15	45

MLS-305	General Pharmacology	2	C	15	45
MLS-306	Systemic Pharmacology	2	C	15	45
MLS 307	General Pathology	3	C	30	45
Total			**43**		

400 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
MLS 402	Medical Laboratory Haematology	2	C	15	45
MLS 403	Medical Laboratory Histopathology I	2	C	15	45
MLS 404	Medical Laboratory Microbiology I	2	C	15	45
MLS 405	Lab Instrumentation & Techniques	2	C	15	45
MLS 407	Practical Exercise II	2	C	15	45
MLS 410	Clinical Chemistry I	2	C	15	45
MLS 408	Laboratory Posting II	2	C	15	45
MLS 411	Blood Group Serology	2	C	15	45

MLS 412	Professional Ethics in Med Lab Science	2	C	15	45
MLS 406	Research Methodology	2	C	15	45
MLS 401	Laboratory Management and Function, Laboratory practice	2	C	15	45
GST401	Character Building, Professionalism and Team Work in Healthcare	2	C	30	--
MLS 401	Medical Laboratory Supply Chain Management	2	C	30	--
MLS 402	Molecular Diagnostics and Bioinformatics	3	C	30	45
MLS 403	Immunology I	2	C	15	45

MLS 404	Tissue Slide Reading and Reporting	2	C	15	45
MLS 405	Special Topics in Clinical Chemistry	2	C	15	45
MLS 406	First Professional Examination	3	C	--	135
Total			**38**		

500 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
MLS 503	Practical Exercises III	2	C	-	90
MLS 505	Seminar	2	C	-	-
MLS 508	Clinical Chemistry II	2	C	15	45
MLS 510	Medical Laboratory Haematology II	2	C	15	45
MLS 512	Medical Laboratory Histopathology II	2	C	15	45
MLS 514	Medical Laboratory Microbiology II	2	C	15	45
MLS 502	Laboratory Posting III	2	C	15	45
MLS 504	Research Project	6	C	-	270

Course Code	Course Title	Unit(s)	Status	LH	PH
MLS 501	Clinical Chemistry III	2	C	15	45
MLS 502	Modern Trend in Haematological Techniques	2	C	15	45
MLS 503	Histopathology III	2	C	15	45
MLS 504	Immunology II	2	C	15	45
MLS 505	Public Health and Field Epidemiology	3	C	15	90
MLS 506	Final Professional Examination	3	C	--	135
MLS 507	Medical Microbiology III	2	C	15	45
Total			**36**		

COURSE CONTENTS

100 LEVEL

GST 111: Communication in English
(2 Units C: LH 15; PH 45)

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple and complex). Grammar and Usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and Critical Thinking and Reasoning Methods (Logic and Syllogism, Inductive and Deductive Argument and Reasoning Methods, Analogy, Generalisation and Explanations). Ethical considerations, Copyright Rules and Infringements. Writing Activities: (Pre-writing, Writing, Post writing, Editing and Proofreading; Brainstorming, outlining, Paragraphing, Types of writing, Summary, Essays, Letter, Curriculum Vitae, Report writing, Note making and many others. Mechanics of writing). Comprehension Strategies: (Reading and types of Reading, Comprehension Skills, 3RsQ). Information and Communication Technology in

modern Language Learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening.

GST 112: Nigerian Peoples and Culture
(2 Units C: LH 30)

Course Contents
Nigerian history, culture and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage

and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation; Re-orientation Strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

BIO 101: General Biology I
(2 Units C: LH 30)

Course Contents
Cell structure and organization. functions of cellular organelles. characteristics and classification of living things. chromosomes, genes their relationships and importance. General reproduction. Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarckism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitats.

BIO 102: General Biology II
(2 Units C: LH 30)

Course Contents
Basic characteristics, identification and classification of viruses, bacteria and fungi. A generalized survey of the plant and animal kingdoms based mainly on the study of similarities and differences in the external features. Ecological adaptations. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth and development.

BIO 107: General Biology Practical I
(1 Unit C: PH 45)

Course Contents
Common laboratory hazards: prevention and first aid. Measurements in biology. Uses and care of microscope. Compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy and proportion; use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in BIO 101.

BIO 108: General Biology Practical II
(1 Unit C: PH 45)

Course Contents
Anatomy of flowering plants, primary vegetative body: stem, leaf and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous and connective tissues. Examination of various groups of lower invertebrates under microscopes, identification of various groups of organisms in Animal Kingdom. And any experiment designed to emphasize the practical aspects of topics in BIO 102.

CHM 101: General Chemistry I
(2 Units C: LH 30)

Course Contents
Atoms, molecules and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence Forces. Structure of solids. Chemical equations and stoichiometry. Chemical bonding and intermolecular forces. Kinetic theory of matter. Elementary

thermochemistry. Rates of reaction. Equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II
(2 Units C: LH 30)

Course Contents
Historical survey of the development and importance of Organic Chemistry. Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nano chemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I
(1 Unit C: PH 45)

Course Contents
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II
(1 Unit C: PH 45)

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

COS 101: Introduction to Computing Sciences
(3 Units C: LH 30; PH 45)

Course Contents
Brief history of computing. Description of the basic components of a computer/computing device. Input/Output devices and peripherals. Hardware, software and human ware. Diverse and growing computer/digital applications. Information processing and its roles in society. The Internet, its applications and

its impact on the world today. The different areas/programs of the computing discipline. The job specializations for computing professionals. The future of computing.

Lab Work: Practical demonstration of the basic parts of a computer. Illustration of different operating systems of different computing devices including desktops, laptops, tablets, smart boards and smart phones. Demonstration of commonly used applications such as word processors, spreadsheets, presentation software and graphics. Illustration of input and output devices including printers, scanners, projectors and smartboards. Practical demonstration of the Internet and its various applications. Illustration of browsers and search engines. How to access online resources.

PHY 101: General Physics I (Mechanics)
(2 Units C: LH 30)

Course Contents
Space and time. Units and dimension, Vectors and Scalars. Differentiation of vectors: displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion. Conservation principles in physics. Conservative

forces. Conservation of linear momentum. Kinetic energy and work. Potential energy. System of particles. Centre of mass. Rotational motion: Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia. gyroscopes and precession. Gravitation: Newton's Law of Gravitation. Kepler's Laws of Planetary Motion. Gravitational Potential Energy. Escape velocity. Satellites motion and orbits.

PHY 102: General Physics II
(Electricity & Magnetism) (2 Units C: LH 30)

Course Contents
Forces in nature. Electrostatics; electric charge and its properties, methods of charging. Coulomb's law and superposition. electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators, current, voltage and resistance. Ohm's law and analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step up and step-down transformers: Maxwell's equations. Electromagnetic oscillations and

waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107: General Practical Physics I
(1 Unit C: PH 45)

Course Contents
This introductory course emphasizes quantitative measurements. The treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems. Light. Heat. Viscosity and many others, covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

PHY 108: General Practical Physics II
(1 Unit C: PH 45)

Course Contents
This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements. The treatment of measurement errors, and graphical analysis. However,

emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

KHAIRUN – MLS 101 Mathematic for Health Sciences
(2 Units, Core, LH= 30; PH=0)

Course contents
Elementary set theory. Subsets. Union. Intersection. Complements. Venn diagram. Real numbers. Integers. Rational numbers. Irrational numbers. Mathematical Induction. Sequences and series. Theory of quadratic equations. Binomial theorem. Complex numbers. Algebra of complex numbers; the Argand Diagram. De-Moivre's theorem. nth roots of unity. Circular measure. Trigonometric functions of angles of any magnitude. Trigonometric formulae.

200 LEVEL

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Course Contents

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding and many others.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 30)

Course Contents

Concept of Entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate Entrepreneurship). Theories, Rationale and relevance of Entrepreneurship (Schumpeterian and other perspectives, Risk-Taking, Necessity and opportunity-based entrepreneurship and Creative destruction). Characteristics of Entrepreneurs

(Opportunity seeker, Risk taker, Natural and Nurtured, Problem solver and change agent, Innovator and creative thinker). Entrepreneurial thinking (Critical thinking, Reflective thinking, and Creative thinking). Innovation (Concept of innovation, Dimensions of innovation, Change and innovation, Knowledge and innovation). Enterprise formation, partnership and networking (Basics of Business Plan, Forms of business ownership, Business registration and Forming alliances and join ventures). Contemporary Entrepreneurship Issues (Knowledge, Skills and Technology, Intellectual property, Virtual office, Networking). Entrepreneurship in Nigeria (Biography of inspirational Entrepreneurs, Youth and women entrepreneurship, Entrepreneurship support institutions, Youth enterprise networks and Environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

MCB 201: Introduction to General Microbiology
(2 Units C: LH 30)

Course Contents
The Kingdom Protista Organization differences in eucaryotic cells classification and nomenclature of micro-organisms. Bacterial cell form, structure nutrition reproduction and metabolism. Bacterial genetics. A typical prokaryotic cell Viruses. Encaryotic Micro-organism-fungi microbial control, microbes in food,

water and environment. Bacterial infection and virulence. Phagocytosis. Introduction to pathogenic microbiology. Laboratory animals, types breeding and uses.

BCH 201: General Biochemistry I
(2 Units C: LH 30)

Course Contents
Introductory chemistry of amino acids; their properties, reactions and biological functions. Classification of amino acids: neutral, basic and acidic; polar and non-polar; essential and non-essential amino acids. Peptides. Introductory chemistry and classification of proteins. Biological functions of proteins. Methods of their isolation, purification and identification. Primary, secondary, tertiary and quaternary structures of proteins. Basic principles of tests for proteins and amino acids. Introductory chemistry of carbohydrates, lipids and nucleic acids. Nomenclature of nucleosides, and nucleotides; effects of acid and alkali on hydrolysis of nucleic acids.

BCH 202: General Biochemistry II
(2 Units C: LH 30)

Course Contents
The cell theory. Structures and functions of major cell components. Cell types, constancy and diversity. Cell organelles of prokaryotes and eukaryotes. Chemical composition of cells. Centrifugation; Methods of cell fractionation. Structure, function and fractionation of extra-cellular organelles. Water, total body water and its distribution. Regulation of water and electrolyte balance. Disorder of water and electrolyte balance. Acidity and alkalinity, pH and pK values and their effects on cellular activities.

BCH 203: General Biochemistry Practical I
(1 Unit C: PH 45)

Course Contents
Laboratory experiments designed to reflect the topics covered in BCH 201 and BCH 202. Introduction to laboratory methods and procedures employed in studying biochemical processes.

ANA 202: Histology of Basic Tissues
(2 Units C: LH 15; PH 45)

Course Contents
Introduction to histology; Method of study in histology; Cell Membrane, Cellular organelles; Cell dynamics and cell cycle. Cytogenetics. Histochemistry and cytochemistry. Introduction to recombinant DNA; In situ hybridization histochemistry. Cell dynamics and cycle. Basic tissues of the body, the epithelial, connective tissues, muscle and nervous tissue. The microanatomy of the four basic tissues, namely: epithelial tissue, including glandular tissue, connective tissue, muscular tissue, and nervous tissue. Covering and Lining Epithelia. Glandular Epithelia. Connective tissue. Bone, Bone formation and Joints. Blood. Muscle. Nervous tissue (PNS). Nervous tissue (CNS). Cardiovascular system. Respiratory system. Integumentary system. Liver, Gallbladder and Pancreas. Gastro-intestinal system. Lymphatic tissue and the Immune system. Endocrine system. Urinary system. Female reproductive system. Male reproductive system. Eye.

ANA 203: General and Systemic Embryology
(2 Units C: LH 30)

Course Contents
Spermatogenesis, oogenesis; ovarian follicles; ovulation; corpus luteum; menstruation; uterine cycle; hormonal control of uterine cycle; fertilization; cleavage; implantation; reproductive technologies-IVF/surrogacy/embryo transfer; embryo manipulation & potency/twinning; molecular embryology and transgenesis; gastrulation; notochord, neurulation; derivatives of the germ layers; folding of the embryo; fetal membranes; placenta; development of limbs and teratology. Growth and perinatology; congenital malformations – general introduction. The cardiovascular system, skin, structure of the nails and hair. Macrophagic system; cellular immunology; lymphoid organs; glands – endocrine and exocrine. Respiratory system. Digestive system. Urinary and genital systems. Electron micrograph studies of each organ.

ANA 201: Anatomy of Upper and Lower Limb
(2 Units C: LH 15; PH 45)

Course Contents
Descriptive terms, plans and terms of relationship of the human body, terms of comparison, attachment of

muscles, types of muscles, movements of joints. Osteology, principles of kinesiology, general organization of body system. Cutaneous innervation of the upper limb; pectoral region; breast; axilla; shoulder region; arm and cubital fossa; flexor compartment of forearm; extensor compartment of forearm; hand; venous and lymphatic drainage of the upper limb. Applied anatomy of nerves; blood supply of the upper limb. Cutaneous innervation of the lower limb; femoral triangle; adductor canal and medial side of the thigh; gluteal region; back of the thigh, popliteal fossa; extensor compartment of the leg and dorsum of the foot; peroneal and flexor compartment of the leg; sole of the foot, arches of the foot; mechanism of walking; venous and lymphatic drainage of the lower limb; applied anatomy of the nerves and blood supply to the lower limb.

PIO 201: Introductory Physiology and Blood
(2 Units C: LH 30)

Course Contents
Introduction and history of physiology. Structure and functions of cell membranes. Transport process. Special transport mechanism in amphibian bladder, kidney, gall bladder, intestine, astrocytes and exocrine glands. Biophysical principles. Homeostasis and control systems including temperature regulation. Biological rhythms.

Composition and functions of blood. Haemopoiesis. WBC and differential count. Plasma proteins Coagulation, fibrinolysis and platelet functions. Blood groups –ABO system – Rh system. Blood transfusion – indication for collection and storage of blood, hazards of blood transfusions. Reticulo- endothelial system. Imunity and immodeficiency disease and HIV.

PIO 203: Physiology of Excitable Tissues
(2 Units: C: LH 30)

Course Contents
Structure and classification of muscles, excitation and contraction theories and principles involved in muscles contraction, resting membrane and action potentials. Generation of impulses in excitable tissues. Nerve and neuromuscular transmissions. Simple reflex and spinal reflexes. Spinal cord ascending, descending pathways. Receptors. Thalamus-sensory motor cortex. Control of posture and movement. The reticular activating system, sleep, neural centers regulating Visceral functions. Neurophysiological basis of instinctive behavior, conditioned reflexes learning, and temperature regulation. Sympathetic and parasympathetic pathways. Role in the various system especially cardiovascular, respiratory and gastro intestinal.

PIO 214: Introduction to Cardiovascular and Respiratory Physiology
(2 Units C: LH 30)

Course Contents
The heart; events of the cardiac cycle. Control of cardiac contractility. Cardiac electrophysiology. Properties of cardiac muscles. Cardiac output - measurement and control. Haemodynamics of circulation. Arterial blood pressure and its regulation. Cardiovascular reflexes. Peripheral resistance and local control of the circulation. Regional blood flow. Cardiovascular changes in exercise, haemorrhage and shock. Respiratory physiology – functions of upper respiratory tract. Mechanics of respiration including compliance. Surfactant. Lung volume and capacities. Pulmonary gas exchange. Blood gas transport. Pulmonary function tests. Nervous and chemical control of respiration. Response to hypoxia, high altitude, exercise and artificial respiration.

PIO 204: Gastrointestinal Physiology
(2 Units C: LH 30)

Course Contents
Physiologic anatomy of the gastrointestinal tract, Review of smooth muscle function, Secretions in the G.I.T. and their control, Movements of the gastrointestinal tract,

Digestion and absorption of various food substances, Physiologic anatomy of the liver and biliary system including their functions, Disorders of G.I.T, The gut as an endocrine organ. Nutrition: energy and other dietary requirements. Basal metabolic rate. Nitrogen balance. Amino acid deficiency. Hormonal control of nutritional needs, vitamins, mineral mechanisms. Food value of local foodstuffs. Diet sheets and nutritional deficiency states.

MLS 201: Introduction to Medical Laboratory Science
(2 Units C: LH 15; PH 45)

Course Contents
General introduction to Medical Microbiology, immunology and Histopathology, specimen collection, reception and registration. Safety precaution in Medical Microbiology Immunology and Histopathology Laboratories. Microscopy use and care of the microscope and other equipment sterilisation-principles and techniques. Glassware-care and maintenance. Refrigeration-Principle, uses and care. General introduction to clinical Chemistry, Haematology and Blood Transfusion Sciences. Storage and disposal of specimens. Specimen containers. Safety precaution in the chemical pathology, Haematology and Blood Bank Laboratories. Handling of Laboratory animals.

STA 201: Biostatistics
(2 Units C: LH 30)

Course Contents
Aims, characteristics and application of biostatistics in clinical and preventive medicine. Statistical data in bio-medical science-samples: population, variables, frequency distribution, vital and descriptive statistics. Measurement of central tendencies-mean: median, mode, dispersion and presentation of data probability distribution, Hypothetical tests of statistical significance. Analysis of variance. Regression and correlation. Experimental designs and clinical trials.

KHAIRUN – MLS 201: History of Medical Laboratory Science
(2 Units Core: LH 45; PH -00)

Course Contents
Global and Nigerian Evolution of Medical Laboratory Science in Nigeria. Institute of Medical Laboratory Technology of Nigeria decree 56 of 1968. Institute of Medical Laboratory Science and Technology decree 54 1999. Medical Laboratory Science Council of Nigeria Act 11, 2003. Early Training of Medical Laboratory Technologists in Nigeria and in the United Kingdom, Full commencement of Training in Nigeria.

Programmes: Certificates, Associate, Fellowship, B.Sc. (Medical Laboratory Science), BMLS (Bachelor of Medical Laboratory Science). Composition and appointment of Board of Medical Laboratory Science Council of Nigeria. Ad Hoc committee and other committees of Medical Laboratory Science Council of Nigeria. The Medical Laboratory Technicians and Assistants Programmes. Leadership of the Institute/Council. Challenges and Prospects of Medical Laboratory Science Education in Nigeria. Training Institutions, Accreditation and Regulation of Practice. Indexing of students and induction of qualified medical laboratory Scientist. Internship programme. Relationship between Medical Laboratory Science Council of Nigeria and National Universities Commission. Relationship between Medical Laboratory Science Council of Nigeria and Association of Medical laboratory Scientists of Nigeria.

KHAIRUN-MLS 202: Introduction to Biology of Diseases
(2 Units Core: LH 15; PH 45)

Course Contents
General concept of disease. Congenital and acquired diseases. Disturbances of normal homeostatic mechanisms. Primary causes of cell disorders. Effects of environmental toxins. Lack of essential metabolites.

Immune disorders. Alternations to metabolic capability. Alterations to metabolic control. Alterations to structural integrity. Accumulation of metabolites. Extracellular accumulations. Trauma, toxins and micro-organisms. The Chemical and biological effects of radiation at the cellular level. Morphological changes at light microscopic and electron microscopic levels. Atrophy. Hyperplasia. Hypertrophy. Aplasia Oncogenesis. Necrosis, senescence and death. Normal flora. Natural defense mechanisms. Pathogenicity. Transmission of infection. Immunity to infection. Bacterial. Viral, Fungal and parasitic infection. Pathophysiology of acute inflammation. Chronic inflammation. Consequences of the inflammatory response (organization, repair, fibrosis, wound healing, repair in specialized tissues).

300 LEVEL

GST 312: Peace and Conflict Resolution
(2 Units C: LH 30)

Course Contents

Concepts of Peace, Conflict and Security in a multi-ethnic nation like Nigeria. Types and Theories of Conflicts: Ethnic, Religious, Social Economic, Geo-political Conflicts; Structural Conflict Theory, Realist Theory of Conflict, Frustration-Aggression Conflict Theory. Root causes of Conflict and Violence in Africa: Indigene and settlers Phenomenon; Boundaries/boarder disputes; farmers/hectares disputes, Political disputes; Ethnic disputes and rivalries; Economic Inequalities; Social disputes; Nationalist Movements and Agitations; Selected Conflict Case Studies – Tiv-Junkun; Zango Kartaf, Ife/Modakeke, Aguleri/Amuleri Native Barrom/Fulani settlers in Plateau. Chieftaincy and Land disputes and many others. Peace Building, Management of Conflicts and Security: Peace & Human Development. Approaches to Peace & Conflict Management --- (Religious, Government, Community Leaders and many others.). Elements of Peace Studies and Conflict Resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and Terrorism. Peace

Mediation and Peace Keeping. Peace & Security Council (International, National and Local levels) Agents of Conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution, ADR. Dialogueb). Arbitration, c). Negotiation d). Collaboration and many others. Roles of International Organisations in Conflict Resolution. (a). The United Nations, UN and its Conflict Resolution Organs. (b). The African Union & Peace Security Council(c). ECOWAS in Peace Keeping. Media and Traditional Institutions in Peace Building. Managing Post-Conflict Situations/Crisis: Refugees. Internally Displaced Persons, IDPs. The role of NGOs in Post-Conflict Situations/Crisis

ENT 312: Venture Creation
(2 Units C: LH 15; PH 45)

Course Contents
Opportunity Identification (Sources of business opportunities in Nigeria. Environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources. Social and climate conditions and Technology adoption gap). New business development (business planning, market research). Entrepreneurial Finance (Venture capital, Equity finance, Micro finance, Personal savings, small business investment organisations and Business plan

competition). Entrepreneurial marketing and e-commerce (Principles of marketing, Customer Acquisition & Retention,B2B, C2C and B2C models of e-commerce, First Mover Advantage, E-commerce business models and Successful E-Commerce Companies,). Small Business Management/Family Business: Leadership & Management, Basic book keeping, Nature of family business and Family Business Growth Model. Negotiation and Business communication (Strategy and tactics of negotiation/bargaining, Traditional and modern business communication methods). Opportunity Discovery Demonstrations (Business idea generation presentations, Business idea Contest, Brainstorming sessions, Idea pitching). Technological Solutions (The Concept of Market/Customer Solution, Customer Solution and Emerging Technologies, Business Applications of New Technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy and many others. Digital Business and E-Commerce Strategies).

MLS 301: Basic Clinical Chemistry
(2 Units C: LH 15; PH 45)

Course Contents
Traditional and S.I units in Clinical Chemistry; Reference values: Gastric function tests; Agents for Gastric stimulation. Ward procedures and Laboratory Investigation of Gastric Secretions. Intestinal function tests; Digestion and absorption; Causes of Malabsorption. Laboratory investigation of malabsorption. Renal function tests; functions of the kidney; Measurement of Renal plasma flow, Glomerular filtration rate – Creatinine clearance, Insulin clearance, Concentration and Dilution Tests; Urinary Acidification Tests, urine specific gravity/Osmolarity Dye Excretion test. Water and Electrolyte metabolism. Acid base balance; Definition and causes of acidosis and alkalosis; Blood buffers. Transport of blood gases; assessment of acid/base status. Lipids; definition and types of lipids; Formation of free fatty acids, ketone bodies and Lactate; Measurement of plasma lipids and lipoproteins. Plasma proteins and physiologic functions; factors affecting synthesis and catabolism. Methods for the determining of total protein in serum. Carbohydrate metabolism: Blood glucose homeostasis; hyperglycaemia diabetes mellitus – its causes and investigation, Hypoglycaemia types, causes and investigation.

MLS 302: Basic Haematology
(2 Units C: LH 15; PH 45)

Course Contents
Origin, development and functions of blood cells. Synthesis and breakdown of haemoglobin. Methods of Haemoglobin estimation. Methods of cell counting. Absolute values. Introduction to Homeostasis. Principle and mode of action of common anticoagulants. Principle and components of Haematological stains. Simple tests used in blood coagulation. Blood films-normal and abnormal. Practical Classes.

MLS 303: Basic Microbiology
(2 Units C: LH 15; PH 45)

Course Contents
Scope of microbiology: Historical approach and many others. Classification and nomenclature of microorganisms. Introduction to the microbial world; Introduction to Bacteriology, Mycology, Virology and Parasitology (the protozoan).

Bacteriology: The general properties of bacteria; structure, growth, reproduction, requirements both environmental and nutritional. Aspects of Bacterial metabolism; bacterial genetics and variation. Sterilisation in Microbiology, bacteria in health and

disease: Antibiotics and chemotherapy; infection and immunity; introduction to laboratory techniques and methods including serology.

Viruses: General properties, structure and biology of viruses, classification various methods, reproduction, resistance, pathology, purification of viruses, propagation of viruses, immunity and diagnosis of viral infection, interferon and interference, inclusion bodies, cytopathic effects. Viral-host interactions and identification.

Fungi: Morphology, groups and classification. Types of lesion and types of mycoses, growth requirements. Characteristics and general features of fungi and their diseases. Identification, and demonstration in the laboratory.

MLS 304: Basic Histopathology
(2 Units C: LH 15; PH 45)

Course Contents
Introduction to Histopathology. Fixation – Autolysis, bacterial decomposition. Effects of fixation, common fixing agents and their uses. Secondary fixation, post-fixation and post-chroming and post-mordanting. Fixation pigments, Decalcification – Aims and applications, decalcifying agents. Tests for clearing of

decalcification. Dehydration, clearing and infiltration/embedding. Frozen and celloidin sections. Embedding media. Basic histology of organs. Principles and application of Exfoliate Cytology. Collection and fixation of specimens for cytological examination. Museum technique-colour restoration. Mounting in museum jars. Tissues and cellular injury inflammation. Healing and repairs. Gross appearance of diseased organs in routine post-mortem examination. Slide sections to illustrate common tumours.

MLS 305: Basic Immunology
(2 Units C: LH 15; PH 45)

Course Contents
The Historical background of Immunology. Classification of Immunity. Innate immunity. Development and structure of cells in the Immune System Cellular interaction the expression and regulation of immunity. Acquired Immunity.

MLS 306: Laboratory Posting I
(2 Units C: LH 15; PH 45)

Course Contents
Laboratory hazards and precautions. General laboratory glassware and apparatus-composition of glass, cleaning of glassware, standardised glassware, general glassware.

Apparatus-autoclave, centrifuge. Production of chemically pure water, elementary microscopy; refraction, refractive index, principal focus of a converging lens, principal focus of a diverging lens, component of a microscope, setting up of a microscope, some do's and do not's of the microscope, micrometry, Dark ground microscope, Flourescent microscope. Collection and reporting of specimens, ward etiquette, postage of specimen, preparation of specimen containers, swabs, collection of autopsy and biopsy specimens.

MLS 307: Practical Exercise I
(2 Units C: LH 15; PH 45)

Course Contents
The student is expected to carry out practical exercises in all the disciplines:

Clinical Chemistry: Titration: presentation of volumetric analysis. Methods for chloride determination. Determination of bicarbonate in plasma, percentage purity of carbonate. Determination of the composition of the mixture NaOH/Na2CO3, NACL/HCL, specific gravity, reactions with ferric chloride, urobilinogen, bilirubin, indicant, myoglobin, cystine, protein, Bence-Jones protein, blood, reducing substances, ketone bodies, phenyl pyruvic acid. Spectroscopy of plasma and urine CSF analysis – sugar, protein.

Haematology and BGS: Blood film, WBC count, haemoglobin estimation, Absolute values, eosinophil count, reticulocyte count. Osmotic Fragility. Blood grouping techniques, Antiserum titration, Anti-human globulin (AHG) direct and indirect, Antibody screening. Donor screening, secretor status.

Histopathology: Preparation of fixatives, removal of formalin pigments, testing of end point of decalcification using chemical methods. General tissue staining by haematoxylin and counter-staining with eosin. Demonstration of elastic and collagen fibres. Prussian blue reaction for iron in tissues. Gram and Ziehl-Nielsen (Z-N) staining methods. Use of automatic tissue processors. Microtome.

Medical Microbiology and Parasitology: Safety precautions in the Microbiology laboratory. Getting familiar with basic tools of microbiologist. Preparation of films and basic staining techniques, the Gram stain, Ziehl-Nielsen stain, spores, capsule and negative staining procedures. Wet preparation and microscopy, Motility tests, Media preparation and culturing. Plate reading.

Demonstration of the ubiquity of micro-organisms especially bacteria from different environment. Recognition of different types of haemolysis. Sensitivity

testing. Use of autoclave. Wet mount for parasites. Identification of trophozoites, cysts and ova of different protozoa and helminths in stool. Thin and thick films preparation for malaria microfilaria and Trypanosome parasites. Staining techniques: Giemsa, Wrights, Fields and Leishman Stains. Identification of Trichomonas spp, Paragonimus spp, Trichuris spp, Schistosoma spp, other Helminthes and protozoa of medical importance. Skin snips. Urine microscopy. Concentration techniques for stool and sputum for ova and cysts. Examination and recognition of Helminthes from tissue Biopsy.

MLS 308: Fundamentals of Blood Group Serology
(2 Units C: LH 15; PH 45)

Course Contents
ABO and Rhesus Blood Groups, Inheritance, distribution and Genetic Theory. Blood Grouping Techniques – principles, disadvantages and advantages. Preparation of antisera – antiserum titration, avidity, Potency and specificity. Plant lectins –Preparation and Standardisation of antisera from lectins such as Dolichos biflorus Anticoagulants used in BGS, ACD, CPD-CPA-A and many others. Modes of Action, Side effects. Blood Bottles (MRC) and Plastic Bags – Advantages and disadvantages. Donor Screening- using CuSO4 method – other methods of screening. Preparation of blood products – cryoprecipitate, platelet rich plasma, packed

cell fresh frozen plasma, fibrinogen and many others. Storage of blood and blood products – various methods, advantages and disadvantages Blood banking-organisation, structures, facilities and records. Blood group specific substances – synthesis, identification method(s) and application. Quality control of physical, chemical and reagent. Practical/tutorials ABO and Rhesus grouping methods, Antiserum Titration DCT and ICT antibody screening.

MLS 309: Basic Medical Parasitology
(2 Units C: LH 30; PH 45)

Course Contents
Introduction to the parasites. Classification of protozoa, (the amoebas, the ciliates, the flagellates, Nematodes. (Ascaris, Strongloides, Trichuris, guineaworm, hookworms, Trichinella, Enterobius and many others). Life cycle and pathogenicity of Cestodes. (The tapeworms, Larval forms of cestodes). Life cycle and pathogenicity of the Trematodes (The Schistosome, Fasciola, Paragonimus, and many others). Methods of demonstration of parasites in blood, faeces, vagina, urine, urethra, pus from lung and liver, skin snips, and many others. Mechanisms of their disease production; Epidemiology and control of parasitic diseases. Arthropods of medical importance particularly members of the class Diptera, the crustaceans, Arachnida,

Hexapoda, Myiasis and many others. Their biology, life cycles and control. Life history as disease vectors. Various diseases of importance transmissible by insects. Biology of mosquito in relation to transmission of malaria, filariasis, viral infections and many others.

MLS 310: Biomedical Engineering
(2 Units C: LH 15; PH 45)

Course Contents
Workshop practice. Principles of use maintenance and repair of common apparatus and laboratory equipment. Principles of applied and general electronics. Circuit diagrams, Computer programming. Improvisation. Glass blowing and construction of simple laboratory equipment. Design techniques, improvement on existing equipment, review and modifications of laboratory methods.

PHA 301: Basic Pharmacology and Toxicology:
(2 Units: C: 15 LH; 45 PH)

Course Contents
Scope of Pharmacology. Origin and sources of drugs, routes of administration of drugs, drug receptors and receptor isolation. Pharmacokinetics, absorption of drugs excretion, biotransformation. Structure-activity relationship. Mode of action of drugs. Types of drug

action. Drug action in man-compliance, individual variations, presence of other drugs, genetic effects, tolerance and tachyphylaxis, effects of diseases, drug toxicity adverse drug reactions, drug dependence and drug interactions. Antimicrobial Pharmacology chemotherapeutic agents, anti-metabolic base analogues, mitotic inhibitors, antibiotics, enzymes, alkylating agents and hormones. Radiation therapy, immune therapy and cancer therapy, synthesis and physiology of neurotransmitters Biochemical basis of depression. Marcotics-Mechanism of action. Fluorescent, radio and chromatographic methods in drug studies. Methods of evaluation of toxins mutagens and carcinogens.

MLS 301 Molecular Biology and Microbial Genetics (2 Units; Core, LH;15, PH;45)

Course Contents

Historical perspectives of Nucleic acids (DNA and RNA). Review of structure and function of nucleic acids and genome organisation of living things. Genetic transformation. Conjugation and transduction. Physical and chemical properties of nucleic acids. DNA replication. Gene concepts and expression (Central Dogma). Protein structures and functions. Mutation: Types and outcomes. Microorganisms whose study is encompassed by microbial genetics. Review of some genetic diseases. Recombinant DNA technology.

Genetically modified organisms (GMO). Introduction to some molecular biology techniques. DNA/RNA extraction and quantification. Electrophoretic separation of nucleic acid materials. Endonucleases and restriction fragment length polymorphism. Northern, Southern and western blot techniques. Recombinant DNA technology and its applications. Applications of microbial genetics.

MLS 302 Forensic Science
(2 Units C: LH 15; PH 45)

Course Contents
Forensic science. Forensic pathology. Similarities and differences between forensic science and pathology Previews of analytical techniques in chemistry. Previews of analytical techniques in chemistry in biology that are so critical in forensic science. Principles and use of sophisticated analytical instruments. Fourier transforms. Infra-red spectroscopy. Liquid chromatography. Nuclear magnetic resonance spectroscopy. Gas chromatography. Mass spectrometry. Induction coupled plasma mass spectrometry. Biological profiling. Introductory toxicology. Physical examination of evidence. Specific aspects of forensic science. Legal issues in forensic case studies.

MLS 303: Medical Laboratory Bio-Risk Management (2 Units C: LH 15; PH 45)

Course Contents

Concept of laboratory bio-risk management. Biosafety and Biosecurity. The AMP model of bio-risk management. Laboratory risk assessment methods. Basic concept of Laboratory hazards. Characterization of risks. Evaluation of risks. Risk mitigation strategies. Basics of bio-risk management performance. Measuring bio-risk management performance. Steps to evaluating performances. Biosecurity and biosafety. Quality management and continuous technical improvement. Work place safety assurance and biosecurity. Biorisks arise from handling clinical samples categorized at the highest risk level due to their unknown nature. Biosafety in medical Laboratories. Standard guidelines on biorisk management and biosafety. Roles of human factors in biorisk assessment. Impact of the implementation of Quality Management System from the International Standard on biorisk and biosafety.

MLS 304: Bio-manufacturing and In-vitro Diagnostics
(2 Units Core: LH 15; PH 45)

Course Contents
Essential equipment and procedures needed in a production unit for laboratory reagents. Basic biochemical reactions, preparation of standard/bulk solutions, dilutions, Assembly of equipment for the preparation standards buffers. Production procedures for reagents and methods in Clinical chemistry including reagents for dry chemistry tests for urine and stool analysis Reagents, Production procedures for reagents and methods in Haematology, Blood Transfusion Science, Histopathology, Medical Microbiology, Immunology, Serology and Parasitology including test strips. Quality assurance and quality control of ingredients for reagents including microbiological culture media. Sourcing for chemicals and biochemical required for the production of Biologicals. Sourcing out for a collection of procedures and manufacturing recipes for the production of simple basic reagents for health laboratory services, Standardization and validation. Registration with relevant accredited organization, Packaging and storage Biological, Introduction to marketing and advertisement. Safe disposal of chemicals and methods for purifying water.

MLS 305: General Pharmacology
(2 Units; Core: LH 15; PH 45)

Course Contents
Transformation, Structure and activity relationship. Mode of action of drugs. Types of drug action, Drug action in man, compliance, individual variations. Presence of other drugs. Genetic effects. Tolerance and tachyphiaxis. Effects of diseases. Drug toxicity. Adverse drug reactions. Drug dependence and drug interactions.

MLS 306: Systemic Pharmacology
(2 Units C: LH 15; PH 45)

Course Content
Drugs mechanism of action as they relate to specific diseases. Drugs mechanism of action as they relate to specific organs. Cardiovascular pharmacology. Hypertension. Pulmonary arterial hypertension. Hypotensiive Heart failure. Anti-arrhythmic drugs. Angina. Anti-hyperlipidaemics. Anticoagulant. Antiplatelet and thrombolytic drugs. Endocrine Pharmacology: - Diabetes mellitus. Obesity. Drugs affecting somatotropic. Pituitary. hypothalamic and adrenal. Cortex hormones. Drugs affecting thyroid function. Musculoskeletal pharmacology: - Rheumatoid arthritis. Osteoarthritis. Systemic Lupus erythromatosus.

Rickets and osteomalacia, Back pain. Gout. Osteoporosis. Skin pharmacology: - Eczema. Psoriasis. Common skin conditions. Reproductive pharmacology: - Contraceptives. Hormone-replacement therapy. Infertility. Erectile dysfunction. Pregnancy. Labour. Abortifacients. Breastfeeding. Other topics: - Drug addiction. dependence and abuse. Drug interaction, Individual variations. Aging and polypharmacy. Harmful effects of drugs. Drugs mechanism of action in neuroscience, immunology, microbiology and oncology with practical component. Drug –receptors interactions. pharmacologic effect. Agonist and antagonist.

MLS 307: General Pathology
(2 Units Core: LH 15; PH 45)

Course Contents
Introduction — Ancient, traditional and modern concept of diseases and their causes. The normal cell and cellular basis of disease. Tissues and cellular injury. Reaction to cellular injury — inflammation. Necrosis, Healing and repair. Disturbances of cell growth — cellular adaptation and neoplasm. Cytogentics and genetic disorders. Pigmentary disturbances. Calcification and Amyloidos Disorders of nutrition. Haemodynamic disorders. Oedema. Embolism. Thrombosis. Shock. Neoplasia. Definition, benign/malignant tumours. Tumour nomenclature, aetiology of tumours. Genes involved in

neoplastic process. Familial syndromes. Chemical, radiation and microbial carcinogenesis. Intracellular accumulations. Pathologic calcification. Intracellular accumulations of protein. Lipids, glycogen and pigments. Infectious diseases. Malaria. Tuberculosis. Leprosy. Schistosomiasis. Syphilis. Amoebiasis. Typhoid. Onchocerciasis.

GST 401: Character Building, Professionalism and Team Work in Healthcare
(2 Units Core: LH 30; PH-00)

Course content:
Concept of leadership and meaning of leaders. Theories, principles and styles of leadership. Methods of developing team wisdom. Teamwork as a personal skill. Creating powerful partnership in mentoring. Mentoring and mentoring skills: Stages of formal mentoring relationships. Introduction to professionalism in healthcare practice. Communication and interpersonal skills. Introduction to general psychology and medical psychology. Counselling psychology in applied psychology. Definition, principles and application of effective communication skills in healthcare settings. The principles of Character Building and types personality traits. Philosophical concepts of Character Building. Code of ethics and principles for various health professions. Case scenarios in health care and their

ethical implications. Introduction to psychoactive substances and their clinical manifestations. Cultural perspectives and management strategies in psychoactive substance abuse.

400 LEVEL

Course Contents

Principles and functions of Management. Personnel Management, Staff/Management relationships, stock control, record keeping. Management and administrative practices. Ecology of administration. Inventory and quality control Accounting and budgeting. Medico-legal aspects of medical laboratory Sciences. Professional ethics. Laboratory planning. Introduction to statistical procedures and biological research estimation, analysis of variance, tests of significance, goodness of fit, correlation and regression. Theory and practice of quality control. Setting up of quality control, various methods of quality control; factors affecting quality of output. Theory and practice of some common Analytical techniques including tissue processing. Microscopy and other basic Microbiological Equipment use, and principles of Histological Equipment, principles and working of haematological clinical chemistry Equipment; other applied techniques in the Medical Laboratory with emphasis on general Medical Laboratory Instrumentation. Practical Classes based on the above topics. General Review and appraisals of all subjects and practice of medical laboratory sciences to be examined as a common General paper.

MLS 402: Medical Laboratory Haematology I
(2 Units C: LH 15; PH 45)

Course Content
Iron metabolism, folate and B2 metabolism. Nomenclature, classification and investigation of common haemoglobinopathies, haemolytic anaemias, myeloproliferative disorders, lymphoproliferative disorders, haemostasis and disorders of haemostasis; investigation of bleeding disorders. Bone marrow. Practical classes.

MLS 403: Medical Laboratory Histopathology I
(2 Units C: LH 15; PH 45)

Course Contents
DNA demonstration by Feulgen techniques. Silver impregnation methods. Genes and genetic code. Tissue culture techniques; chromosome analysis. Autoradiography – Definition and principle of organisation of a medical museum. Methods of colour maintenance. Fixation and storage of museum specimens. Special museum techniques such as Dawson's Method. Principle of Photography Preparation of stained sections for micro photography. Preparation of specimens for preparation of stained sections for micro photography. Cytological normal cells. Histology of tissues. Atypical and malignant cells. Collection of

cytological smears and processing and screening. Principles of general pathology. Systemic pathology. Gastrointestinal tract. Urogenital, cutaneous. Principle of Electron microscopy materials for electron microscopy. Respiratory – Tuberculosis. Nephropathy associated with infestations and infections. Embalming techniques and demonstrations and infections. Practical based on the topics.

MLS 404: Medical Laboratory Microbiology I
(2 Units C: LH 15; PH 45)

Course Contents
Epidemiology of communicable diseases and disease spectrum and control. Aspects of public Health and Environmental Microbiology. Applied Microbiology; aspects of food and Industrial Microbiology. Diagnostic Microbiology. Vaccine production and immunization. Preservation of cultures and cultural methods. Pathogenic mechanisms of bacteria. Antibiotic assays and monitoring from body fluids and many others, anaerobiosis and methods. Phage typing; Research Methods and other techniques in Microbiology. Use of metabolic pathways in identification of bacteria, fluorescent antibody methods. Quality control and Instrumentation. Practical based on the above topics.

MLS 405: Laboratory Instrumentation and Techniques
(2 Units C: LH 15; PH 45)

Course Contents
Instrument aspects of qualitative and quantitative analysis – theory and practice of some common analytical techniques: colourimetry, spectroflorimetry flame photometry, conductometry, polarography, and many others. Osmometry, Rephelometry, Turbidimetry, pH Measurement by ion specific electrodes – Separation techniques including electrophoresis, - paper, cellulose acetate, Agar gel, starch and polyacrylamide gel, Isoelectric focusing, Isotaphoresis, Chromatograpy – paper, Thin Layer Chromatography, Gas Liquid Chromatography, Ion exchange, gel filtration, molecular sieves; Dialysis filtration, solvent extraction, Centrifugation – Ultracentrifugation. Immuno-electrophoretic techniques, Radioimmunoassay, Competitive protein binding, Isotope dilution techniques, Enzyme Immuno Assays, Receptor Assays, Automation, Micro and Ultra micro-Analysis. Practical based on the above topics. Theory and practice of some common Analytical techniques including tissue processing, Microscopy and other basic Microbiological Equipment, Principles and working of haematological Equipment, other applied techniques in the Medical Laboratory with

emphasis on general Medical Laboratory Instrumentation. Practical exercises on the above topics.

MLS 406: Research Methodology
(2 Units C: LH 15; PH 45)

Course Contents
Introduction to research methodology. Collection of literature review articles problem definition. Sampling technique Experimental designs of medical and public health studies. Questionnaire design and collection analysis. Interpretation and utilization of research findings. The role of research in health and social welfare. The need for Institutional and Governmental ethical clearance for some research projects. Research proposals and sourcing of funding for research projects. Art of scholarly publications and Instructional design.

MLS 408: Laboratory Posting II
(2 Units C: LH 15; PH 45)

Course Contents
Basic medical laboratory tests in Medical Microbiology/Parasitology including Virology, Mycology and Bacteriology, chemical pathology, Haematology and Blood Transfusion science and Histopathology. Such tests include detection of malaria parasites in blood and intestinal parasites in stool. Wet

preparation and Gram staining of biological specimens. Preparation of media and inoculation of specimen. Determination of Hb, PCV and processing of blood samples for Haematology and blood Transfusion examinations. Screening of blood donors and Determination of ABO and Rhesus blood groups. Urinalysis, estimation of glucose, urea. Processing of Histopathology specimens including fixation, staining and cutting of tissues.

MLS 410: Clinical Chemistry I
(2 Units C: LH 15; PH 45)

Course Contents
Porphyrin, causes, symptoms and laboratory investigation of porphyrinaemia, porphyria and Porphyrinuria, Haemoglobin, synthesis, function. Glycosylated haemoglobins. Abnormal haemoglobins and haemoglobinopathies, Liver function Tests.

Mechanism of Enzyme action and kinetics: Clinical Enzymology; Isoenzymes in medicine, Coenzymes and Vitamins. Definition, causes, consequences and investigation of some inborn errors of metabolism; Phenylketonuria, galactosaemia fructose intolerance, Albinism, aminoaciduria, Endocrine glands and functions; the hypothalamus, the pituitary, the parathyroid, adrenal cortex, adrenal medulla, the gonads

and reproductive endocrinology. Foeto-placental function. Calcium and bone metabolism. Pancreatic function tests. Basic neurochemistry, CSF normal composition and changes in disease.

MLS 411: Blood Group Serology
(2 Units C: LH 15; PH 45)

Course content
Blood groups – Other blood groups such as MNS, Duff, Kell, Kidd and many others. Grouping techniques and antibody screening, clinical significance, secretor status, antenatal Serology – screening and Titration. Compatibility procedures – different methods, advantages and disadvantages, Blood Transfusion reactions – causes and types; Investigation, Risks attendant in blood transfusion – Diseases, Anaphylactic, haemolytic and allergic reactions. Screening of Donor blood for disease agents such as HbAgs, HIV, VDRL. Practical/tutorials. Compatibility procedures – advantages and disadvantages. Practical based on the above topics.

MLS 412: Professional Ethics in Medical Laboratory Science
(2 Units C: LH 15; PH 45)

Course Contents
Introduction to the Science and profession of Medical Laboratory Science. The different arms of medical Laboratory Sciences. Hall marks characterizing the lives of all professions; licensing to practice, Group culture patterns. Justice, rights and responsibilities as a professional.

The concept of duty, professional standards and Laboratory management. Authority and discipline. The use of reason. Personal relationships – inter and intra professional, Act of good faith. Place of religion in the hospitals. Value judgment, exercise of professional judgment, skill and care charge and wellbeing of patients. Patients - professional relationship – confidentiality, communication skills; trust; seeking to safe guard patients, particularly in respect to health and safety and information. Research training, professional development, knowledge and skill, quality control in the field of medical laboratory sciences and practice: Reputation. Fulfilment of professional role with integrity, refraining from its misuse to the detriment of patients, employers and colleagues. Medico-legal aspects.

MLS 401: Medical Laboratory Management and Supply Chain
(2 Units

Course Content
Medical Laboratory Managements including; definition and principles, role of medical Laboratories in health care, training of laboratory personnel, upgrading and carrier development. Laboratory organization management, communication management. Specimen collection and processing. Documents and Record Managements. Productivity and Work Area Management. Quality Assurance and Quality Control Management. The role of Medical Laboratory Scientist in Health Supply and Public Health Supply Chain. Health Commodity Supply chain; Commodity security framework, logistics as an essential of commodity security. The purpose of logistics system, key logistics terms, Dispense to user data and issue data. Policies and Standardization of Laboratory Services. Introduction to procurement and supply chain management (PSM), Introduction to Standard Operation Procedure (SOP). Serving Customers. Logistics Management Information System (LMIS). Max/Min Inventory Control System; the purpose of ICS, types of Max/Min Inventory Control Systems, Calculation of the parameters. Adjusting the Pipeline in the Max-Min ICS and assessing stock status,

Storage of Health Commodities. Product Selection. Quantification and Procurement. Inventory Management. Policy and Regulatory Environment. Financing for Laboratory Commodities and Logistics Systems. Commodities for Laboratory Services. Characteristics of Laboratory Commodities. Classification of Laboratory Commodities.

MLS 402: Molecular Diagnostics and Bioinformatics (3Units Core: LH 30; PH 45)

Course Contents

Advanced techniques in molecular biology and applications: Polymerase chain reaction (conventional or end point PCR. qPCR. reverse transcriptase PCR (rtPCR). Touch down PCR (tdPCR), gradient PCR and digital PCR, Genomic/cDNA library – Preparation and isolation. Cloning. Primer design and RT-PCR and its application in diagnosis. Introduction to Sequencing technologies: Maxam Gilbert and Sanger sequencing. Next Generation sequencing (NGS). Introduction the data bases (NCBI, PDB, Swiss Prot, Plasmo DB etc.). Introduction to bioinformatics and computational biology, Data mining and storage. Phylogeny. Sequence editing and alignment. BLAST. Gene mapping. Open reading frames and consensus sequences. Introduction to Omics sciences (Proteomics: determination and prediction of protein structure and folded motifs, protein

remodelling and visualisation, genomics. Transcriptomics. metabolomics and metagenomics). Introduction to forensic science.

MLS 403: Immunology I
(2 Units Core: LH 15; PH 45)

Course Contents
Structure and function of Immunoglobulin. General organization and assembly of Immunoglobulin. Classification of Immunoglobulin. Antigen-antibody interactions of Immunoglobulin. Phagocytic cells. Chemotaxis and effector function of macrophages and granulocytes. The complement system and complement abnormalities. Innate Immunity — factors affecting e.g. age, species specific, anatomical factors (skin membranes), nutrition, hormones, acquired Immunity — active and passive — factors affecting acquired Immunity. Lymphoproliferative organs and their functions in Immune responses. Diagnostic serological tests for assessing humoral Immunity. Tissue and organ transplantation — HLA system. Transplantation and pregnancy. Hypersensitivity reactions (To include description and classical disease of type one, type two, type three and type four hypersensitivity reactions). Immunological tolerance. Autoimmunity and autoimmune diseases. Immunosuppression and immunodeficiency diseases. Immunity and infections.

Tumor immunology. Immune reactions in tissue damage. Primary and secondary immunodeficiency diseases. Diagnostic tests for assessing cellular immune functions. Principles of fractionation. Procedures of vaccination and immunization.

MLS 404: Tissue Slide Reading and Reporting
(2 Units Core: LH 15; PH 45)

Course Contents
Preparation of stained tissue slides. Histological slides. Cytological slides. Simple tissues. Complex tissues. Good tissue slides. Poor tissue slides. Preservation of stained tissue slides. Immuno- Histochemistry (IHC) stained tissue slides. Organisms in tissues. General procedures/guides for slide reading; Tissue scoring. Gram-stained tissue slides. Common features of inflammation. Necrosis. Healing and repair. Tumor/Cancer.

MLS 405: Special Topics in Clinical Chemistry
(2 Units C: LH 15; PH 45)

Course content
Interpretation of data generated in clinical chemistry. Analysis and preservation of some rare specimen in clinical chemistry. Tumour markers. Pregnancy and its disorder-maternal and fetal health assessment.

Complication of pregnancy. Maternal serum-screening for fetal defects. Overview of laboratory tests in pregnancy. Clinical chemistry of paediatric and geriatrics- new-born laboratory screening methods. Inborn error of metabolism and results interpretation. Therapeutic monitoring of drugs; Reproductive disorders- male and female reproductive biology, infertility. Establishment and use of reference ranges

KHAIRUN-MLS 406: First Professional Examination (3 Units Core: LH=0; PH=135)

Course Contents

This is a build-up to the practical exercises and Laboratory posting. Only students in good standing (with passes in all courses at the end of level 400 are eligible to sit for the examination). Evaluation of skills at reception and processing of sample Test of basic bench skill acquisition in General laboratory practice. Test of basic bench skill acquisition in hematological assays. Test of basic bench skill acquisition in blood group serology methods. Test of basic bench skill acquisition in bacteriology procedures. Test of basic bench skill acquisition in parasitic identification. Test of basic bench skill acquisition in histopathology procedures. Test of basic bench skill acquisition in cytopathology procedures. Test of basic bench skill acquisition in serological assays. Test of basic bench skill acquisition

in clinical chemistry/chemical pathology assays. Test of basic bench skill acquisition in immunochemical assays including immunochromatographic assays. Urinalysis including pregnancy tests. Reporting laboratory results. Presentation of practical work. Identification, maintenance and uses of laboratory equipment and component parts. Identification of insect and insect-like animals. Simple interpretation of laboratory results/outcome. Only students in good standing (with passes in all courses at the end of level 400 are eligible to sit for the examination).

500 LEVEL

MLS 502: Laboratory Posting III
(2 Units C: LH 15; PH 45)

Course Contents
Conduct of complex and intellectually tasking medical laboratory tests independently and in the specific area of specialisation. Organisation and leadership in the administration and use of the laboratory. Coordination with other professionals that utilise laboratory services. Innovative technologies like molecular biology techniques e.g PCR, antigen/antibody serological assays among others.

MLS 503: Practical Exercises II
(2 Units C: PH 45)
Each student carries out practical based on the area of major specialty.

Clinical Chemistry
Determination of blood glucose, glucose tolerance test. Determination of calcium and phosphate, uric acid, cholesterol, creatinine clearance, electrolytes and urea, total protein albumin and globulin. Plasma protein electrophoresis. Determination of plasma enzymes: - aspartate transaminase, alanine transaminase, acid and alkaline phosphatase. Demonstration. Blood gases and

pH by Astrup Technique. Paper and thin layer chromatography, Immuno-electrophoresis and agar gel immuno-diffusion techniques.

Demonstration: Radioimmunoassay of hormones in blood. Estimation of 17-oxo and Oxogenic steroids in urine. Estimation of urinary buffers. Calculation from first principle. Absorption and calibration curves. Colour Equivalence of artificial standards. Fractional test meal. Calculi analysis.

Haematology and Blood Group Serology

Investigations in paternity dispute. Investigation of haemorrhagic and preparation of cryoprecipitate, haemolytic disease of the new born (HDN), haemoglobinopathies, auto-immune haemolytic anaemia, enzymopathies. Preparation of anti-sera, bovine albumin, anti-human globulin. Gamma globulin neutralization test. Forensic application of Blood Group Serology. Differential leucocytes count. Cytochemical procedures. Advanced techniques such as Demonstration of Iron, Foetal Haemoglobin, Ham's Test and many others.

Histopathology

Special staining methods – PAS, Manson trichrome, Iron Impregnation Methods. Cytological staining methods and collection of cytological samples. Chromosome analysis. Autoradiography. Museum techniques. Cyto-

screening and slide reporting. Cutting sections using the microtomes. Tissue (cell) culturing, Fungi, amyloid, enzyme and other specialized demonstration methods.

Medical Microbiology and Parasitology
Examination, culture and identification of bacteria in CSF pleural, ascitic fluid. Blood culture, High vaginal swab, wound swabs, ear, eye, nasal and other swabs. Stool bacteriology. Sputum bacteriology, Urine bacteriology. Systemic fungal culture and identification. Semen analysis. Special serological tests. ASO Widal, VDRL, rheumatoid factor, Complement fixation, neutralization, haemagglutination tests for identification of viruses. General identification of micro-organisms by animal inoculation. Biochemical tests for the identification of vibrio cholera, Shigella, Candida, Neisseria. Allied Health Sciences **362** New

MLS 504: Research Project
(6 Units C: PH 270)

Course Contents
Independent research findings into some selected areas/topics of interest to the student and acceptable to the supervising academic staff. Students will be required to carry out literature survey on the topics, perform experiments and produce reports (preferably at the end of second semester). Students will be subjected to both

seminar and oral examination on the projects they undertook.

MLS 505: Seminar
(2 Units C: LH 30)

Course Contents
A seminar on the current concepts or advances on a specific topic in medical Laboratory Science. The aim is to develop in the student, the ability to search for past and current literature on any given topic with the Medical Laboratory Course.

MLS 508: Clinical Chemistry II
(2 Units C: LH 15; PH 45)

Course Contents
Analytical Techniques. Birth of a new method, devising new techniques, biological trials and tests for acceptability. Solid/dry phase chemistry, dipstick technology, thin film technology. Immobilised enzymes. Analytical techniques employed in qualitative and quantitative determination of (a) Enzymes: phosphatases, transaminases, dehydrogenases, Kinases (b) Hormones: catecholamines and metabolites peptide and steroid hormones (c) Proteins: total proteins albumin and globulin, specific proteins (d) Lipids: cholesterol, triglycerides, glycerol, fatty acids and lipoproteins. (e)

Trace elements – Fe, Cu Zn, Mg, Selenium (f) non-protein nitrogen – Urea, creatinine, creatine, uric acid, amino acids and ammonia Urinalysis; determination of urine specific gravity, osmolarity; qualitative tests for protein, glucose. and reducing substances, Ketone bodies, bilirubin urobilinogen and blood. Haemoglobin and haemoglobin derivatives in urine. Spectroscopy of haemoglobin and its derivatives in blood and urine.

MLS 510: Medical Laboratory Haematology II
(2 Units C: LH 15; PH 45)

Course Contents
Anaemias, Disorders of Iron metabolism, vitamin B12 and Folate deficiencies, Haemochromatosis and related storage disorders; Radioisotopes in Haematology; Automation in Haematology, Haemoglobinopathies. Cytochemical procedures, Lymphocyte Transformation Tests. Myelomatosis and order paraproteinemia. Test. Advanced Techniques.

MLS 512: Medical Laboratory Histopathology II
(2 Units C: LH 15; PH 45)

Course Contents
Theory and Methodology of Histochemistry – Chromaffin tissues, Schmols, Diazo and Perls and other histochemical techniques. Enzyme histochemistry: Acid

and alkaline phosphatase, Oxidative enzymes. Genetic diseases. Karyotype abnormalities. Chromosome techniques. Tissue culture technique. Chromosome staining techniques Slide reporting.

MLS 514: Medical Laboratory Microbiology II
(2 Units C: LH 15; PH 45)

Course Contents
General characteristics of fungus diseases, types of mycoses and properties; opportunistic fungi Diagnosis and chemotherapy. Systemic mycoses (cryptococcosis, blastomycoses, histoplasmosis, coccidioidomycoses). Opportunistic mycoses (candidiasis, phycomycetes, aspergilloses and many others). subcutaneous mycoses. (Such as maduro mycoses, sporotrichoses, chromoblastomycosis, and many others. Cutaneous mycoses – dermatophytosis. Superficial mycoses and many others. General properties, pathogenesis, diagnosis, epidemiology and control and recognition of fungi. Derma tropic and viscerotropic viruses. Smallpox, cowpox and vaccination; measles, rubella, chickenpox and shingles, Herpes viruses. Yellow fever; Lassa fever, Hep A and B, Influenza, Arbor viruses. The neurotropic viruses (rabies, poliomyelitis, encephalitis, lymphocytic choriomeningitis virus, mumps viral transformation and types of tumours and viruses. Oncogene theory and

many others. Viral gastroenteritis; Miscellaneous viruses.

KHAIRUN-MLS 501: Clinical Chemistry III
(2 Units Core: LH 15; PH 45)

Course content
Physiology of the Kidney. Renal clearance and glomerular filtration rate. Renal plasma flow. Maximal tubular excretory and reabsorptive cap, Urea clearance, creatinine and inuline clearance. Concentration and dilution tests. Impairment of renal function. Renal failures. Azotaemia. Ureamia. Anuria. Sodium loss in renal disease. The liver — anatomy and physiology — Biosynthesis of bilirubin. Excretion of bile pigments. Jaundice — types and pigment excretion in jaundice; urine, blood urea and ammonia. Paraproteinaemia. Bence Jones proteinuria and significance. Porphyrinaemia, porphyria and porphyrinuria. Definition, causes, consequences and investigation of some inborn-errors of metabolism. Phenylketonuria. Galactosaemia. Fructose intolerance. Albinism. Akaptonuria. Aminoacidurias. Causes and investigations of nutritional disorder.

MLS 503: Histopathology III
(2 Units Core: LH 15; PH 45)

Course Contents
General Cytology. Histology and Pathological technique. Control of results and management of Histopathology laboratory. Cytology of cells. Epithelial cells and tissues. Atypical and malignant cells. Gynae-Cytology. Hormonal evaluation. Cells and other constituents. Sputum, effusions. Urine and other fluids. Cytological fixatives and stains. Cytoscreening. Principles of general pathology applied to individual organs. Hypertensive heart disease. Heart failure and cardiomyopathies. Respiratory – Tuberculosis. Nephropathy associated with infestations and infections. CNS. Special senses. Malignant lymphomas. Liver – cirrhosis. Liver cell carcinoma. Hepatitis virus. Electron microscopy – preparation of materials for electron microscopy. Embedding reagents used in Electron microscopy. Techniques involved in autoradiograph. Laboratory Management. Quality control and automation in histopathology laboratory

MLS 502: Modern Trends in Haematological Techniques
(2 Units, Core: LH= 15; PH =45)

Course contents
Haemolysin titration. Absorption and Elution techniques. Principles, uses and techniques of producing commercial quantities of mono and polyclonal antisera. Quality assurance in BGS. Principles and techniques of isoelectric focusing. Protein separation by column chromatography. DNA Finger printing - principles and techniques. Purification of proteins/enzymes - Ultracentrifugation and molecular weight determination. Electrophoresis- starch, agar gel and polyacrilamide gel, Culture of blood for haemoparasites. Leucocyte and platelet antigens typing. Principle and technique of platelet function assays. Labeled immunoassays - Flourescence and radio antibody techniques. ELISA. Western blotting. Immunolectrophoresis. Competitive protein binding. Paul Bunnell test, Demonstration of Iron, Foetal Haemoglobin. Ham's test. Preparation of enzymes used in BGS, Special compatibility techniques: emergency compatibility testing - Low ionic sucrose solution. Spin Coomb's albumin. 2-stages of Coomb's technique. Exchange and Extracorporeal blood transfusion techniques, Automation in BGS – Groupmatic and Technic on autoanalysers for antibody

and antigen detection and identification. Principles of polymerase chain reaction. Forensics serology.

MLS 504: Public Health and Field Epidemiology
(3 Units, Core: LH= 30; PH =45)

Course contents
General principles of microbial disease transmission — waterborne, airborne, food borne, arthropod-borne and contagious diseases. Principles and techniques for water treatment. Waste water disposal, preventive measures in the control of Bacteria. Parasitic and viral infections. Epidemiological study of protozoans and helminth infections in rural and urban communities. Epidemiological study of mycotic agents in rural and urban communities. Key concepts of infectious diseases such as COVID-19, Diptheria, Lassa fever, Monkey pox etc., as well as field and Laboratory methods used in their diagnoses and control as applied to public health, investigations of outbreak, Disease surveillance. Case control studies. Cohort studies. Laboratory diagnosis. Molecular epidemiology. Dynamics of transmission. Vaccines and Immunization programme and schedule (EPI). Assessment of vaccine field effectiveness. Methods used in non-communicable disease control as applied to public health, Disease surveillance in the Nigerian setting as well as the international settings. Epidemiology of non-communicable diseases (NCD), to

include the burden, risk factors, socioeconomic impact, control and preventive strategies for common heart diseases like Angina, hypertension, arrythmias, valve diseases, hereditary and congenital heart conditions; stroke, neoplasms like leukemias, breast cancer, cervical cancer, lymphomas, colorectal cancer. Pancreatic and ovarian cancer; common anemias like anemia of pregnancy, hemoglobinpathies and other anemias; Asthma and its phenotypes. Common autoimmune diseases like rheumatoid arthritis. Systemic lupus erythematosus. Autoimmune thyroiditis and myasthenia gravis; Primary and secondary immunodeficiency diseases. Diabetes. Renal failure. Protein calorie malnutrition. Epidemiology of air pollution, asthma, cardiovascular diseases, Gene-environment interactions and the toxicity of metals and pesticides in children. Workers and other adults. Effects of pesticides on humans. Male reproductive toxicity. Arsenic and bladder cancer. Dioxin Pollution and exposure.

MLS 505: IMMUNOLOGY II
(2 Units, Core: LH= 15; PH =45)

Course Content
Flow cytometry and its applications in diagnosis of hematological malignancies. Future flow cytometric technologies and applications. Functional assays of B cells. Isolation and cryopreservation of peripheral blood

mononuclear cells. The human microbiome and clinical immunology. Laboratory assessment of complement deficiencies. Protein analysis in immunology laboratory. Immunochemical characterization of immunoglobulins in serum. Urine and CSF. Laboratory evaluation of monoclonal gammopathies. Pyroglobulins, cryoglobulins and cryofibrinogenemia evaluation. Modern methods for quantification of immunoglobulins. Methods for detection of antigen specific T cells. Regulatory T cells assays. Measurement of NK cell phenotype activity and functions. Laboratory evaluation of chronic granulomatous disease. Multiplex cytokine assay, cytokine measurement using flow cytometry. Cytokine receptor analysis. Diagnostic value of cytokine analysis. Immunofluorescence methods in the diagnosis of renal and cardiac diseases. Quantitation and standardization of allergens, assay methods of the detection of allergic inflammatory markers. Tests for immunological reactions to foods. Diagnosis of eosinophilic disorders. Approach to the laboratory evaluation of immunodeficiency diseases. Immunodiagnosis and laboratory evaluation of rheumatoid arthritis and systemic lupus erythematosus. Methods for the detection of antinuclear antibodies. Evaluation of autoantibodies in autoimmune hemolyticanemia. Antimitochondrial antibodies in primary biliary cholangitis. Laboratory evaluation of celiac disease and autoimmune thrombocytopenia. Future perspective in laboratory

assessment of autoimmune diseases. Laboratory monitoring of cancer immunotherapy. Immunoassay based tumor marker measurements. Molecular methods in human leukocyte antigen testing. Histocompatibility laboratory in the 21st century. Molecular and serological evaluation of solid organ rejection. Testing for chimerism. Evaluation of humoral and cellular immune response in transplant rejection. Principles of validation and quality control in immunology laboratory

MLS 506: Final Professional Examination
(3 Units, Core: LH= 0; PH =135)

Course content
This is a build-up to the practical exercises (MLS 503: Practical Exercises II) and Laboratory posting. Only students in good standing (with passes in all courses at the end of level 500 are eligible for the examination). Each student carries out the practical based on the area of major specialty as indicated in MLS 503: Practical Exercises II. Test of acquisition of specialized skill in haematology. Test of acquisition of specialized skill in histopathology. Test of acquisition of specialized skill in Chemical pathology. Test of acquisition of specialized skill in immunology. Test of acquisition of specialized skill in serology. Test of acquisition of specialized skill in microbiology. Test of acquisition of specialized skill

in identification of parasites. Test of acquisition of specialized skill in blood group serology.

MLS 507: Medical Microbiology III
(2 Units, Core: LH= 15; PH =45)

Course contents
Collection, Preservation and storage of viruses from clinical specimens. Culture methods for the isolation of viruses **(**inclusion bodies andcytopatic effects, animal innoculation, egg innoculation, cell and tissue culture). Laboratory diagnosis of viral infections **(**Haemaglutination test, complement fixation test, PRNT, ELISA, PCR, etc.). In-depth study of pathogenesis, immunology, epidemiology and management of viruses of medical importance, including: retroviruses, togaviruses, coronaviruses, rhabdoviruses. Flaviviruses, piconaviruses, orthomyxoviruses, paramyxoviruses, filoviruses, bunyaviruses, arenaviruses and reoviruses, parvoviruses, hepadnavirus, papillomaviruses, adenoviruses, herpesviruses, poxviruses, unassigned virusese. Principles of purification and concentration in virology. Equipments Care Maintenance in medical virology Laboratory. Vaccine production. Antiviral drugs and mechanism of viral resistance to antiviral agents. Viral vaccine and immunoprophylaxis and Immune evasion mechanisms by viruses. Arthopods and other vectors of medical imortance diseases (Human and

animal). Negelated tropical diseases. Parasitological staining and preservation technique. Culture of parasites and preservation of insects.

Registration of Students with Medical Laboratory Science Council of Nigeria (INDEXING)

Students are expected to register with Medical Laboratory Council of Nigeria (MLSCN), a sole body regulating the practice of the profession in Nigeria at 300 Level. Student who fails to register will not be allowed to sit for the first professional examination of the Council.

Requirement for Rgistration with the Council

i. Same requirements for admission through the Joint Admission and Matriculation Board adopted by the University.
ii. Payment of certain amount to be determined by the Council from time to time. All payments are made through remita.

Procedure for Registration with Medical Laboratory Council of Nigeria (MLSCN)

Students are expected to fill indexing form and submit to the clinical Co-coordinator with following:

i. Evidence of payment of prescribed fee by the Council
ii. Photocopy of on-line copy of O' level results
iii. Photocopy of JAMB admission Letter and result slip
iv. Photocopy of Admission letter by the University

Laboratory Posting Requirement

Clinical Laboratory posting is done at Health Facilities recognized by MLSCN starting from 300 Level and is handled by qualified registered Medical Laboratory Scientists. The posting is compulsory for the students of 300 to 500 Levels

First Professional Examination

The examination is taken at the of second semester at 400 level covering all quasi specialties of Medical Laboratory Science.

Final Professional Examination

Students should only take examination in the speciality they have chosen to major. The areas of Specialization are:

i. Chemical Pathology
ii. Haematology
iii. Histopathology
iv. Immunology
v. Medical Microbiology

Requirements for Professional examinations are the same for the Departmental Examination. The examinations are purely based on clinical Laboratory postings.

Block Laboratory Posting

This posting is done at second semester of 400 level. It is synonymous to Students Industrial Working Experience Scheme (SIWES). The posting assessment is as follows:

i.	Attendance	30%
ii.	General Performance	40%
iii.	Proper documentation	10%
iv.	Punctuality	5%
v.	Creativity	5%
vi.	Relationship with colleagues	5%
vii.	Overall Assessment	5%

Hospital Based Laboratory Coordinator

To ensure strict compliance of the posting, University appoints associate staff at the hospital for coordination and supervision, this is in addition to the Clinical Coordinator who is an academic staff of the Department. The Clinical Coordinator also is saddled with the following responsibilities

i. Indexing of students with MLSCN
ii. Coordinating Professional Examinations
iii. Induction of Graduands for oath administration by MLSCN

Level Coordinators

Level Coordinators are responsible for:

i. Keeping records of students
ii. Serve as Counselors for the students of that Level

iii. Compilation of results
iv. Collation of continuous assessment and examination results from course tutors

MLSCN Policy on Induction

The council being having the sole mandate of registering qualified medical laboratory scientist, inducts successful Graduands of the programme into the profession.

Induction procedure includes administration of oath and and enlightenment on code of ethics. Students are given provisional registration to enable them practice in the hospital for a period of one year as interns, in MLSCN accredited hospital laboratories in the country.

The Council shall be informed on the commencement of internship by forwarding letters of appointment. Senior member of the profession are expected to supervise the internship programme. Students are rotated through all major specialties in the hospital laboratories and Logbook signed by the supervisors, Head of Departments and Chief Executive Officer of the Institution under which training was conducted. After the completion of internship programme, the logbook is submitted to the Council for licensing as an Associate of the Profession.

Classification of Degree

i. The performance of a student in a semester will be reported by the Grade Point Average (GPA) while

the overall performance at the end of the session (and/or at any point in his study programme) will be reported by the Cumulative Grade Point Average (CGPA).

ii. The degree is unclassified even though final GGPA is determined for assessing student performance on the the transcript.

Final CGPA	**Grade**
3.50 – 5.00	A
3.00 – 3.49	B
2.50 – 2.99	C
< 2.50	Fail

Academic Standard

Academic Writing Guide

All students of the department shall maintain the highest academic integrity when writing projects, reports, essays, terms papers, assignments, and any other work required for the degree programme. Such standards include, but are not limited to, the following:

i. A student shall not submit the work of others as his/her own work.

ii. A student shall not submit any work submitted earlier for another purpose (either by him/herself or by others; either at the University or somewhere

else) in order to satisfy the requirement for a course or programme.

iii. A student must cite appropriate sources of his/her ideas, facts, etc. In particular, the following require citation by a student:
   a. Direct and indirect quotations, as well as paraphrasing and summaries.
   b. Opinions, theories, principles, ideas, critical methods, and so on that were formulated by someone else.
   c. Data and evidence that are not collected by the student as primary data.
   d. Figures, graphs, tables, charts, photographs, drawings, illustrations, etc not created by the student.
   e. Research sources that were gathered by someone else.
   f. Ideas, materials, information and so on collected from online sources.

iv. A student shall not plagiarise any works by others, be they in books, journals, over the World Wide Web, and so on. As a general rule direct use of three or more words from someone else must be enclosed in quotation marks (“ ”) with the source appropriately indicated.

v. A student shall not fabricate, nor misrepresent data, results of experiments or analysis, sources of information, and so on.

vi. Student(s) shall not sabotage the work of others. Examples include deliberate destruction, damaging or stealing of another student's project.
vii. Although, some forms of discussions and exchange of ideas may be in order, students shall not collaborate in any work meant to be done individually.

General Guide for Writing BMLS Research Projects

- Research title should comprise of not more than 22 words
- All chapters/sectional headings should be capitalized, while sub-headings should be written in lower case and bolded, but the first letter and all proper nouns should be in capital letter.
- All writings should be in font size 12, double line spacing, and times new remain should be used as font style.
- All materials used for the study must be duly acknowledged, using American psychological Association (APA) style of in-text citation and referencing.
- All items on cover page & title page should be written in capital letters.
- Completed research work should be spiral bonded for proposal and internal defense, while that of external defense should be hard cover bonded.

- The cover page should consist of;
  - The University logo at the central top area of the cover page
  - Title of research project
  - Name and registration number of student
  - Date of graduation
- The spine should comprise of the student's name, title of degree (BMLS) and date.
- Obsolete materials should not be used except in case of definition and theories. Therefore Journal articles should not be more than 5 years while text books, should not be more than 10 yrs.
- All pages of the main work should be numbered using Arabic numerals (1, 2, 3,…) at the bottom central part of each page.

PRELIMINARY PAGES

All preliminary pages should be numbered using roman numerals in lower case (i, ii, iii.), and the should comprise of the following;

TITLE PAGE, which should comprise of;

- Title of research project,
- The name and registration number of the student,
- Department and faculty of submission and the degree to be awarded. This should be in capital letters and should be written as thus

Being a Project Submitted to the Department of Medical Laboratory Science; Faculty of Allied Medical Sciences, Khalifa Isyaku Rabiu University of Nigeria. In Partial Fulfilment for the Award of Bachelor of Medical Laboratory Science Degree:

- Date of Graduation

i. **CERTIFICATION**- student should certify their work as thus;

This is to certify that this project conducted by **xx name of student xx** was duly supervised by **xx name of supervisor xx** and it is approved in accordance with the requirements for the award of Bachelor of Medical Laboratory Science degree in the Department of Nursing Sciences, Khalifa Isyaku Rabiu University of Nigeria.

_____	_____
Name of Supervisor	Signature and Date
_____	_____
Name of Head of Department	Signature and Date
_____	_____
Name of External Examiner	Signature and Date

ii. **DECLARATION**

The declaration should be stated thus;

I hereby declare that this project was carried out by me and has not been published or presented elsewhere for the award of any degree. All materials used for this work has been duly acknowledged.

_____ _____

Name of Student Signature and Date

iii. **DEDICATION**

iv. **ACKNOWLEDGEMENT**

v. **V to X TABLE OF CONTENTS, LISTS OF TABLES AND LIST OF FIGURES**

vi. **ABSTRACT:** This should be in a single paragraph comprising of a brief background, aim, methodology, results conclusion and recommendation.

MAIN BODY OF THE PROJECT

CHAPTER ONE

1.0 Background of study

1.1 Statement of problem

1.2 Aim of study and specific objectives

1.3 Research questions
1.4 Significance of study
1.5 Delimitation
1.6 Limitations of the study (where applicable)
1.7 Operational definition of terms

CHAPTER TWO
LITERATURE REVIEW
2.0 Introduction
2.1 Subheadings of reviewed literatures based on study objectives
2.2 Theoretical framework/conceptual framework
2.3 Research Hypothesis

CHAPTER THREE
RESEARCH METHODOLOGY
3.0 Introduction
3.1 Research Design
3.2 Study Setting
3.3 Target Population
3.4 Sample Size
3.5 Sampling Technique
3.6 Research Instrument
3.7 Validity and Reliability of Research instrument
3.8 Method of Data Collection
3.9 Data Analysis
3.10 Ethical Consideration

CHAPTER FOUR
RESULT AND ANALYSIS

4.0 Introduction

4.1 to 4x – (Descriptive and Inferential Analysis of Study Findings Presented in relevant tables and charts)

4.3 - Hypothesis Testing

CHAPTER FIVE
DISCUSSION SUMMARY AND CONCLUSION

5.0 Discussion

5.1 Summary

5.2 Conclusion

5.3 Recommendations - This should be in statement form not bullet points

5.4 Implication to Nursing - This include implication to nursing practice, nursing research and education.

REFERENCES: Should be written in APA format. (All in- text citations should be referenced.

Appendix I - Research instrument (s)

Appendix II - Ethical approval/permission/Clearance

Appendix III – Consent/ assent form (where applicable)