

UNIVERSITY OF NIGERIA, NSUKKA
SCHOOL OF POSTGRADUATE STUDIES

PDG, M.Sc AND Ph.D

PROGRAMMES FOR DEPARTMENT
OF MEDICAL LABORATORY SCIENCES

2018

LIST OF POSTGRADUATE SUPERVISORS IN THE DEPARTMENT OF MEDICAL LABORATORY SCIENCES:

(A) Chemical Pathology

1. Dr Okwuosa C.N

(B) Haematology

1. Dr. Ufelle S.A
2. Dr. Mrs. Ezigbo E.D
3. Dr. Mrs. Eluke B.C

(C) Histopathology

1. Dr Achukwu P.U
2. Dr. Mrs. Azubuike N.C

(D) Microbiology

1. Prof. Mrs. Onyenelukwe N.F
2. Dr. Udeani TKC

(E) Immunology

1. Prof. Mrs. Onyemelukwe N.F
2. Dr. Udeani TKC

UNIVERSITY OF NIGERIA, NSUKKA

PGD, M.Sc AND Ph.D PROGRAMMES OF THE DEPARTMENT OF MEDICAL LABORATORY SCIENCES

1.1 PHILOSOPHY

The programme is aimed at exposing the students to an advanced knowledge of the theory and practice of Medical Laboratory Sciences. Students would further be exposed to the application of Medical Laboratory Sciences in key areas such as Medicine, food and beverages, pharmaceutical industries, as well as utility departments like the water corporation etc.

1.2 SCOPE

The programme shall run at PGD, Master's and Doctorate levels as follows:

1. Clinical Chemistry
2. Haematology
3. Histopathology
4. Medical Microbiology
5. Immunology

1.3 OBJECTIVES

The objectives of the Postgraduate programme are:-

- i. To produce competent Medical Laboratory Scientists who can take full charge of medical laboratories in Teaching and Specialist Hospitals or in community health centers
- ii. To produce Medical Laboratory Science teachers for under-graduate and postgraduate courses for relevant facilities in Universities and other Higher Institutions and Research Centers throughout the country and world-wide.
- iii. To develop graduate research expertise in laboratory and Clinical Medical Laboratory Science disciplines.
- iv. To produce scientists who are able to modify existing techniques, understand the working of laboratory instruments and reagents, modify them and fabricate new ones.

1.4 EMPLOYMENT OPPORTUNITIES

Successful graduates in Medical Laboratory Sciences are equipped for careers in research institutions, tertiary institutions, Ministry of Health, teaching hospitals, private hospitals, water corporation, breweries, Pharmaceutical industries, food industries, equipment fabrication industries or be self employed. Firms, organizations and Governments may take advantage of the postgraduate programme to give short-term training to their employees in the relevant fields.

1.5 ADMISSION REQUIREMENTS: PGD, M.Sc and Ph.D

A. Postgraduate Diploma programme:

ADMISSION REQUIREMENTS:

- i Candidates for the PGD are required to have obtained a degree in Medical Laboratory Sciences (third class), an acceptable Medical Laboratory Science Professional diploma (AIMLS)
- ii Candidates with HND from recognized institution with not less than upper credit and;
- iii Candidates must satisfy the 'O' level entry requirements which is minimum of credit in English Language, Mathematics, Physics, Chemistry and Biology in not more than two (2) sittings.

Duration of the programme:

Regular students: Full Time: 2 Semesters minimum (same programme may require a little more than the stipulated period. A maximum of 4 semesters.

B. Masters of Science (M.Sc) Degree Programme Medical Laboratory Sciences:

Admission Requirements:

1. Candidates must obtain at least a B.MLS second class (Honours) degree in Medical Laboratory Sciences of the Department of Medical Laboratory Sciences of the University of Nigeria, Nsukka or its equivalent from a recognized University with a CGPA of 3.00 on a 5 point scale or its equivalent.
2. Also Postgraduate Diploma of the Department Medical Laboratory Sciences, University of Nigeria, Nsukka with at least 3.50 GPA on a 5-point scale is acceptable for the M.Sc programme.

Duration of the programme

Full Time: A minimum of 4 semesters

A maximum of 8 semesters

Part-time: A minimum of 6 semesters

A maximum of 10 semesters

C. Doctor of Philosophy (Ph.D) Degree Programme in Medical Laboratory Sciences

Admission Requirements:

1. The basic entry requirement is M.Sc degree of the Department of Medical Laboratory Sciences or in related areas obtained from the University of Nigeria, Nsukka or from other recognized Universities recognized by senate provided that the M.Sc is passed with grade point average of at least 3.5 on the 5 point scale or its equivalent and a thesis score not lower than 60% (B).
2. Candidates must also have obtained Bachelors degree from an approved University with a minimum of second class lower division with a CGPA of **3.0/5.0**.

Duration of the programme

Full Time: A minimum of 6 semesters

A maximum of 10 semesters

Part Time: A minimum of 8 semesters

A maximum of 14 semesters

Requirements for Graduation:

Doctorate (Ph.D) programmes should be primarily by research. In addition, the Departmental Postgraduate Committee may prescribe some courses of not more than 12 credit units to be taken by the candidate. A Doctoral (Ph.D) Thesis of 12 credit units must be defended before a panel of examiners.

1.6 NUMBERING OF STRESS AREAS

General Theory methodology and research seminars	-	0
Clinical Chemistry	-	1
Haematology	-	2
Histopathology	-	3
Microbiology	-	4
Immunology	-	5
Project Report/Thesis	-	9

2.0 PGD Course

The postgraduate diploma is designed for graduates whose degrees do not meet the entry requirements for Masters degree work in the first instance or candidates who may need to do the in-depth work. Candidates for Postgraduate Diploma will be expected to complete a minimum load of 24 units before graduation. The programme consists mainly of course work and research project. The postgraduate diploma is done full time or Part-time. Successful completion of the postgraduate diploma may not necessarily qualify a student to progress to M.Sc programme. Postgraduate students will be required to take all the core courses and the ancillary remedial courses.

Compulsory Common Courses:

All candidates must register all the compulsory common courses

<u>COURSE NO</u>	<u>TITLE</u>	<u>UNITS</u>	
		<u>1st Semester</u>	<u>2nd Semester</u>
MLS 0601	The biology of Disease	3	
MLS 0602	Biomedical Engineering, Instrumentation and techniques	4	
MLS 0603	Laboratory practice, Measurement and Research methodology	3	
MLS 0604	Postgraduate diploma seminar		3
MLS 0691	Postgraduate diploma project		4
		10	7

Required Ancillary Remedial Courses

All candidates must pass this following Ancillary Remedial Courses:

MLS 0663	Bioenergetics, metabolic pathways and Inborn errors.		3
MLS 0635	Biostatistics in Health technology		3
MLS 0661	Introduction to computer science		3
		3	6

PGD Specialization:

Candidates are advised to register the 6 units courses relevant to the various specializations as listed below:

(A) CLINICAL CHEMISTRY

MLS 0611	General Clinical Chemistry	3	
MLS 0612	Separation and Analytical Methods		3
MLS 0613	Clinical Biochemistry	3	
		6	3

(B) HAEMATOLOGY

MLS 0621	General Haematology	3	
MLS 0622	Medical Haematology		3
MLS 0623	Transfusion Science	3	
		<hr/>	<hr/>
		6	3

(C) HISTOPATHOLOGY

MLS 0631	General Histopathology	3	
MLS 0632	Cellular Pathology		3
MLS 0633	Methods in Histopathology	3	
		<hr/>	<hr/>
		6	3

(D) MICROBIOLOGY

MLS 0641	General Microbiology	3	
MLS 0642	Medical Microbiology		3
MLS 0643	Applied Microbiology	3	
MLS 0644	Public Health Parasitology/Entomology		3
		<hr/>	<hr/>
		6	6

(E) IMMUNOLOGY AND IMMUNOCHEMISTRY

MLS 0651	General Immunology	3	
MLS 0652	Methods in Immunology		3
MLS 0653	Immuno Cells and functions	3	
		<hr/>	<hr/>
		6	3

COURSE DESCRIPTIONS

MLS 0601 THE BIOLOGY OF DISEASE: This involves a detailed study using a case-oriented and inter-disciplinary approach of the laboratory investigation of disease. The cell as a basic of life and disease, cellular response to insult the nature of the immune response, general and systematic pathology aspect, pathogenicity, inflammation, complement, Haemostasis, Anaemia, leucocyte, disorders, malignancy, congenital disorders. Aspects of pharmacology, the scientific investigation of disease.

MLS 0602 Biomedical Engineering Instrumentation and Techniques, Principles of applied and general electronics and the mechanics of electrical circuits, fault finding, care and maintenance of electrical equipment in laboratory use. Workshop practice, improvement on existing equipment, manifestation and review of laboratory tests, etc

4 units

MLS 0603 LABORATORY PRACTICE, MANAGEMENT AND RESEARCH METHODOLOGY Laboratory management, professional ethics, principles of quality control, principles of learning resources, laboratory records and statistical analysis, research methodology problem definition, sampling techniques, literature review, questionnaire design and data collection analysis, interpretation and utilization of research finding, role of research in health and social welfare, art of scholarly publication etc.

3 units

MLS 0604 PGD SEMINAR

Under the supervision of a staff, the student is expected to take seminar topics on chosen fields for detailed study using library methods, emphasizing on recent advances. The course is expected to give the student the opportunity for independent thought and expression. The work is finally presented to staff and students and also written up

3 units

MLS 0691 PGD PROJECT

Each student is expected to carry out a fairly detailed research investigation under the supervision of a staff in his chosen field. Write it up as a project report and be examined for his knowledge of the work before a panel of external and internal examiners in an oral examination.

4 units

MLS 0611 GENERAL CLINICAL CHEMISTRY

The purpose and scope of clinical chemistry investigation. Body fluids and electrolyte balance, acid-base balance, carbohydrate metabolism, protein metabolism, lipid metabolism, blood lipids, urinalysis

3 units

MLS 0612 SEPARATION AND ANALYTICAL METHODS

Chromatography, HPLC, affinity etc, Chemi-luminescence assays, electrophoresis, immunodiffusion, fluorimetry, immunoassays, automation, end point analyzers, radioisotopes, computer aspects etc. Analytical principles.

3 units

MLS 0613 CLINICAL BIOCHEMISTRY

Liver, kidney, gastrointestinal tract, biochemical investigations, assessment, functions and malfunction. Calcium and skeletal metabolism, muscle, biochemistry of vascular disease, coma, haem and iron, biochemistry of cancer. Protein metabolism-structure, function, regulation, estimation, and clinical significance. Biochemical investigation of hypo and hyper gamma globulinaemias, clinical biochemical tests in nutritional homeostasis,

- endocrine and pathological disorders, toxicology and therapeutic drug monitoring 3 units
- MLS 0621 GENERAL HAEMATOLOGY**
Cell metabolism, physiology, genetics, reticuloendothelial system and blood, Anatomy and microanatomy, advanced principles of haematological practice. 3 units
- MLS 0622 MEDICAL HAEMATOLOGY**
Cell counting, immunological aspects, kinetics, biological and radioassay systems, electrophoretic, chromatographic and spectrophotometric analysis, cytochemistry and rheology anaemias, disorders of iron metabolism, vitamin B12 and folate deficiencies, haemochromatosis and related storage disorders, automation in haematology, lymphocyte transformation tests, Paul Bunell tests etc. 3 units
- MLS 0623 TRANSFUSION SCIENCE**
Immunoglobulins, detection of antigens and antibodies, tissue and blood group system, reagents used in blood group serology and immunology. Investigation of blood transfusion reactions, haemolytic anaemias, antenatal serology, applied blood group serology, autoimmunization, quality control in serology etc. 3 units
- MLS 0631 GENERAL HISTOPATHOLOGY**
Cytogenetics, histochemistry, principles and techniques and chromosome analysis, autoradiography, basis of photographic and museum techniques, electron microscopy. Introductory general pathology. Diseases due to deficiencies and excesses, gross appearance of disease and organism, routine and post mortem examination slides. 3 units
- MLS 0632 CELLULAR PATHOLOGY**
Normal structure and ultrastructure of cells and tissues and general principles of methods for examining them. Physiological variation, immune responses, aspects of applied histology and cytology. 3 units
- MLS 0633 METHODS IN HISTOPATHOLOGY**
Chemistry of fixation, freeze drying, theories of staining, immunocytochemistry, histochemistry, theories of staining, molecular structure and classification of dyes, instrumentation used in cytophotometry, cell, tissue and organ culture. Quantitative microscopy, embedding

procedures, preparatory techniques for associated cells and tissues, transmission electron microscopy, laboratory safety. 3 units

MLS 0641 GENERAL MICROBIOLOGY

Structure and physiology of micro-organisms, microbial interactions, taxonomy and nomenclature, workings of the international committee on systematics, destruction of micro-organisms, genetic transfers, products of microbial metabolism etc.

MLS 0642 MEDICAL MICROBIOLOGY

Nature, occurrence, distribution, mode of infection, isolation and identification of bacteria, fungi, viruses of medical importance. Immunology of these organisms, methods in microbiology: infection and immunity. Bacteria in health and diseases. 3 units

MLS 0643 APPLIED MICROBIOLOGY

Role of micro-organisms in industrial processes. Foods, spoilage, vaccines, agriculture, soil, breweries, antibiotics, etc. Aspects of water microbiology and disease control. 3 units

OR

MLS 0644 PUBLIC HEALTH PARASITOLOGY/ENTOMOLOGY

Helminths and protozoa of medical importance, insects as vectors of disease. Methods of diagnosis, biology, nature, control. Immunity to parasites.

3 units

MLS 0651 GENERAL IMMUNOLOGY

Historical development and background, theories, innate immunity, acquired immunity, cellular interaction in the expression and regulation of gene expression.

MLS 0652 METHODS IN IMMUNOLOGY

Detailed aspects of immune diagnosis and serology. Modern techniques and trends 3 units

MLS 0653 IMMUNE CELLS AND FUNCTIONS

Ontogeny of the immune system and immune response. Physiogenetic development of the immune system in vertebrates and invertebrates. Phagocytes and phagocytosis, structure and physiology of the lymphoid system, lymphocytes, origin development and functions. Immunoglobulins, chemistry and relationship to functions. Immunological response to infection, aspects of transplantation, hypersensitivity and autoimmunity. 3 units

3.0 M.Sc: A study for the degree of Masters would be pursued the following way: By course work to be examined in written papers together with research work to be presented in a **thesis**, where course work predominates over research and constitutes not less than two-thirds of the total credit hours. Candidates for the master’s degree will be required to take a minimum credit load of 30 units before graduation and will be required to do all the core courses and 6 other courses in chosen area of specialization. Each candidate shall deliver a seminar of his project (proposal seminar) and a final seminar at the end of his project.

M.Sc DEGREE PROGRAMME

M.SC SPECIALIZATION

Candidates must register at least 6 (18 credit units) of the following courses in their areas of specialty. In addition, all candidates must also register for seminar/special topics (2 units) and undertake projects (6 units) in their areas of specialty.

a. Core Courses:

Irrespective of specialization, all candidates shall register the following compulsory courses:

		1 st	2 nd
MLS 607	Advances in Molecular Biology	3	
PGC 601	Research Methodology and ICT Application		3
MLS 603	Entrepreneurship Studies	3	
MLS 604	Master’s Research Seminars/Special Topics	2	
MLS 605	Advanced Immunology and Immunochemistry		3
MLS691	Master’s Research Project		6

M.Sc Specializations

Candidates shall register 6 courses that are relevant to their specialization area

A. Clinical Chemistry		1 st	2 nd
MLS 611	Advanced General Clinical Chemistry	3	
MLS 612	Clinical Endocrinology	3	
MLS 613	Clinical Enzymology	3	
MLS 614	Lipid Biochemistry		3
MLS 615	Analytical Toxicology		3
MLS 616	Clinical Biochemistry		3
MLS 617	Inborn Errors of Metabolism	3	
MLS 618	Nutrition and Metabolism Disorders	3	
B. Haematology		1 st	2 nd
MLS 621	Advanced General Haematology	3	
MLS 622	Haemostasis		3
MLS 623	Disorders of the blood		3
MLS 624	Laboratory investigation, diagnosis and Therapeutics (compulsory)	3	
MLS 625	Instrument, automation and Management	3	
MLS 626	Advanced Blood banking		3
MLS 627	Advanced blood group serology		3
MLS 628	Immuno-haematology	3	
C. Histopathology		1 st	2 nd
MLS 631	Advanced General Histopathology	3	
MLS 632	Advanced general Pathology (compulsory)		3
MLS 633	Applied Cytology	3	
MLS 634	Advanced Histochemistry (compulsory)		3
MLS 635	Tissue Culture and Museum Techniques		3
MLS 636	Advanced Anatomical Techniques	3	
MLS 637	Advanced Applied Histology	3	

D. Microbiology		1 st	2 nd
MLS 641	Advanced General Microbiology	3	
MLS 642	Advanced Water, Pollution and Sewage Microbiology		3
MLS 643	Advanced Systemic Virology		3
MLS 644	Advanced Pathogenic Bacteriology	3	
MLS 645	Advanced Antimicrobial Agents and Chemotherapy	3	
MLS 646	Advanced Medical Mycology	3	
MLS 647	Bacterial Genetics and Genetic Engineering	3	
MLS 648	Advanced Microbiology and Biotechnology	3	
MLS 649	Advanced Medical Parasitology		3
MLS 660	Advanced Public-Health Microbiology		3
MLS 661	Advanced Pharmaceutical Microbiology		3
MLS 662	Advanced Medical Entomology		3
E. Immune and Immunochemistry		1 st	2 nd
MLS 651	Advanced General immunology	3	
MLS 652	Historical Advances and Immune Cells		3
MLS 653	Tumour Immunology	3	
MLS 654	Transplantation Immunology		3
MLS 655	Immunopathology	3	
MLS 656	Immunochemistry		3
MLS 657	Methods in Immunology	3	

COURSE DESCRIPTIONS FOR M.SC DEGREE PROGRAMME

PGC 601 Research methodology & application of ICT in research - 3 Units

In-depth research work aimed at acquiring full knowledge and presentations in scholarly writing of the concepts, issues, trends in definition and development of the study area from African and Western perspectives . Major steps in Research: selection of problem, Literature review, Design, Data collection, analysis and interpretation, conclusions. Study of various research designs, Historical, case studies, surveys, descriptive, cross-sectional, experimental, etc. Analysis, surveys, and synthesis of conceptual and philosophical foundations of different disciplines. Identification of research problems and development of research questions and or hypothesis. Detailed treatment of methods of collecting relevant research data and format for presenting research results. Data analysis and result presentation in different disciplines using appropriate analytical tools. Methods of project/dissertation writing. Application of

appropriate advanced ICT tools relevant in every discipline for data gathering, analysis, and result presentation. Essentials of spreadsheets, internet technology and internet search engines. All registered M.Sc students must attend a solution based interactive workshop to be organized by the school of postgraduate studies for a practical demonstration and application of the knowledge acquired from the course conducted by selected experts

MLS 607 Advanced Molecular Biology 3units

Introduction to Molecular biology and genetic engineering RNA, DNA structure, gene, reverse transcriptase, retro virology, protein synthesis. Other enzymes in molecular biology, DNA polymorphisms, DNA sequencing, Southern blot, Northern blot, Western blot, polymerase chain reaction technology and applications, gene cloning, recombinant DNA products, Advances in Analytical techniques. The human genome project, cloned genes and diagnosis. Vaccines, Hormones, Gene Therapy, Genomic Libraries. Social implications of biotechnology and ethical issues.

MLS 602 Research Methodology

Definition of research:

Introduction to research methodology, 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 Government ethical clearance for some research projects. Research proposal and sourcing of fundings of research projects. Art of scholarly publications, and instructional design, types of research investigations; general and specific purpose research; research process, e.g, identification and specification of aims and objectives; assumption, hypothesis formulation, theoretical modeling, sampling techniques, avoidance of bias; definition of variables, instruments for data collection, repeatability, validity, relevance. Calibration of equipments, electronics and integrated circuit; fault detection and troubleshooting; basic measuring instruments-principles of action; handling of laboratory animals. Data processing, editing and preparation of data analysis; interpretation of results and findings; report writing, ethics of research integrity.

MLS 603 Entrepreneurship Studies

Introduction and evolution of entrepreneurship, Challenges of entrepreneurship, Techniques for improving the creative process, Competitive advantage, Feasibility analysis, forms of business ownership and franchising, forms of business financing, Right location and layout for a small business, Importance of a business plan.

MLS 604 Master's Research Seminars/Special Topics **2 units**

Written presentation by individual students of seminar papers on selected topics in MLS 691 current trends and topical issues (about 3 seminars)

MLS 611 Advanced General Clinical Chemistry **3 units**

General advanced courses in clinical chemistry, units, carbohydrate metabolism, biochemistry of Haem and iron, biochemistry of cancer, biochemistry of selected populations, physiological and biochemical mechanisms and their investigations. Advances in general biochemical instrumentations, separation and analytical methods and principles.

MLS 612 Clinical Enzymology **3 units**

Structure and the molecular basis of enzyme function, characterization and purification of enzymes. Distribution and regulation of enzymes actions. Isoenzymes, coenzyme and proenzymes. Pathophysiologic mechanisms in the application of interpretation of enzyme assays. Theories of enzyme catalysis and specificities. Structure and mechanisms of enzymes actions. Application in Medicine.

MLS 613 Clinical Endocrinology **3 units**

Mode of steroid and protein hormone action, regulations, measurement, dynamic function and biochemical investigations of hormones and disorders of anterior pituitary gland, thyroid, parathyroid, adrenal cortex, medullar and gonads, ectopic hormones, hormones in oncology, infertility and endocrine emergencies, MENS etc.

MLS 614 Lipid Biochemistry **3 units**

Lipid, Lipoproteins and Apolipoproteins of human plasma, and their physiological functions, methods of analysis and standardization of methods. Disorders of lipid metabolism, pathogenesis of atherosclerosis, lab investigation of lipid disorders.

MLS 615 Analytical Toxicology**3 units**

Principles and mode of action of common drugs and therapeutic agents. Understanding of drug induction, resistance, and addiction. Drug interactions, principles of qualitative and quantitative drug screening and monitoring, measurements of common drugs and poisons in biological fluids and tissues. Environmental and ecotoxicology, treatment and disposal of hazardous wastes, phytotoxicology, experimental, clinical, forensic, food and applied toxicology.

MLS 616 Clinical Biochemistry**3 units**

The biochemical investigation of liver disease notably jaundice as differential diagnosis, biochemical assessment of renal plasma flow, tubular function, stone formation, renal diseases, nephrotic syndrome, proteinuria, function and regulation of calcium metabolism and role of parathyroid hormones.

MLS 617 Inborn Errors of Metabolisms**3 units**

The human genome project, detailed consideration of causes and consequences of genetic mutations, types of mutations, protein as a gene product, aminoaciduria, inborn errors of the connective tissues, laboratory investigations of inborn errors of metabolisms, molecular diagnostics.

MLS 618 Nutritional and Metabolic Disorders**3 units**

Vitamin and mineral deficiencies: Antioxidants, fat, carbohydrate and protein disorders. Assessment of obesity e.g. Body mass disorders (BMI). Diabetes and other pancreatic disorders. Protein calorie malnutrition, lab management of DM.

MLS 691 Master's Research Project**6 units**

Each student is expected to carry out a detailed research investigation under the supervision of a supervisor in his chosen field, write it up as project report and be examined before a panel of Chief External Examiner and Internal Examiners in an oral examination.

MLS 621 Advanced General Haematology**3 units**

Cell metabolism, physiology and genetics. Growth requirements, stimulation, suppression, requirements for the control of DNA and protein synthesis, gene inheritance and expression. Enzymology, cell metabolism, energy metabolism,

membrane function, genetic counseling, cytogenetics, chromosome damage reticuloendothelial system and blood haemopoiesis, structure and function of blood, erythropoiesis, leucopoiesis, thrombopoiesis, haematology of the newborn, and the aged antigens, antibodies and tumour immunology.

MLS 622 Haemostasis

3 units

Haemostasis, blood coagulation-cascade, platelet, bleeding, biochemical basis of vascular diseases etc.

MLS 623 Disorders of the Blood

3 units

Aetiology and occurrences. Pathogenesis of inherited and acquired disorders from anaemia, leukaemias, fibrinolytic disorders. Diagnostic techniques in haematology. Pathophysiology, cellular and molecular mechanisms of Leukaemias, lymphomas and myelomas. Role of haematology Laboratory in diagnosis and treatment of patients with these conditions.

MLS 625 Laboratory Investigations, Diagnosis and Therapeutics

3 units

Haematological studies and practice, diagnosis, immunological, serological and radioisotopes. Haemostatic function studies, blood fractions, monitoring of chemotherapy and immune-suppressive therapy.

MLS 626 Instrumentation, Automation and Management

3 units

Design, performance, application and evaluation of equipment for continuous flow, discrete and selective fast analyses, electrometry, absorptiometry, fluorometry, flow cytometry, and enzyme immunoassays. Statistical analysis of laboratory data. Management and control.

MLS 627 Advanced Blood Banking

3 units

Care, selection and organization of blood banking, donors, inventories, issues, check control, storage quality control, transfusion studies, hazard and diseases, cell separating machines etc.

MLS 628 Advanced Blood Group Serology

3 units

Detailed knowledge of erythrocyte, granulocyte, Lymphocyte etc. preparation, standardization, quality control of human and non-human blood grouping reagent,

Rhesus D haemolytic diseases, autoimmune processes paternity testing and basic forensic serology, Geographic applications and compatibility studies.

MLS 629 Immuno Haematology **3 units**

Immunobiology of the major histocompatibility complex, cell mediated and hormonal immunity. Immunosuppression, immune deficiency principles of hybridoma production.

MLS 631 Advanced General Histopathology **3 units**

Advanced general knowledge of histological methods and science, fixation and uses, advanced preparatory techniques for dissociated cells and tissues. Embedding procedures, microtomy and ultra microtomy. Cryotomy, dyes and techniques, cryoschromes, and metallic salts, vital staining, histochemical methods to demonstrate cells, tissues and constituents.

MLS 632 Advanced General Pathology **3 units**

The scientific aspects of important diseases of individual systems, and the scientific basis of therapy, pathogenicity, normal flora, natural defence mechanisms, inflammation, pathophysiology of acute and chronic inflammation, consequences of the inflammatory response, (organization, repair, fibrosis, wound healing), the beneficial and damaging immunologic consequences of the inflammatory response; complement, principles behind the sampling and examination of cells and tissues removed for diagnostic and forensic purpose in life and post mortem.

MLS 633 Advanced Applied Histology **3 units**

Methods of obtaining and handling trophies, large surgical specimen and post mortem tissues, special fixatives and their applications, Decalcification and preparation of undecalcified sections. Special methods for the central and peripheral nervous system. Application of stains and histochemical methods to diagnostic problem and the significance of the results obtained.

MLS 634 Applied Cytology **3 units**

Methods of obtaining specimens: Special preparatory techniques, application of special stains, techniques, application of special stains, techniques and cytochemical methods to diagnostic problems. Chromosome analysis. Premalignant, malignant changes in cytological reparations of epithelial surfaces, body fluid secretions and

parenchyma tissues; cytopathic effect of viruses, bacteria, fungi, parasites etc, Cytological monitoring of Therapy, colomscopy etc. chromosome and DNA studies, paternity testing.

MLS 635 Advanced Histochemistry

3 units

Chemistry of fixation, freeze drying, cryopreservation, artifacts, theories of staining, molecular structure and deossification of dyes. Histochemistry of carbohydrates, lipids, proteins, amyloid, acids, enzymes, pigments etc. immunocytochemistry, theory and design of instruments in cytophotometry.

MLS 636 Advanced Anatomical Techniques

3 units

Advanced general knowledge of histological methods and science, fixation and uses, advances preparatory techniques for dissociated cells and tissues. Embedding procedures, microtomy and ultra microtomy. Cytotomy, dyes and techniques, cryoschromes, and metallic salts, vital staining, histotochemical methods to demonstrate cells, tissues and constituents. Advances in museum methods transparencies, paper mounted section, photography and micro incineration, osteological preparations, embalming and plastination.

MLS 637 Advanced General Pathology

3 units

The scientific aspects of important diseases of individual systems, and the scientific basis of therapy, pathogenicity, normal flora, natural defence mechanisms, inflammation, pathophysiology of acute and chronic inflammation, consequences of the inflammatory response, (organization, repair, fibrosis, wound healing), the beneficial and damaging immunologic consequences of the inflammatory response; complement, principles behind the sampling and examination of cells and tissues removed for diagnostic and forensic purposes in life and post mortem.

MLS 638 Advanced Applied Histology

3 units

Methods of obtaining and handling trophies, large surgical specimen and post mortem tissues, special fixatives and their applications, Decalcification and preparation of undecalcified sections. Special methods for the central and peripheral nervous system. Application of stains and histochemical methods to diagnostic problems and the significance of the result obtained.

MLS 641 Advanced General Microbiology **3 units**

Advances in microbial physiology and metabolism, structure and composition, biosynthetic path ways and their regulation, mechanism of energy production, mechanism of sporulation, transport mechanisms, endospore formation, interactions of micro-organisms with their hosts, microbial pathogenic mechanisms, bacteria in health and disease.

MLS 642 Advanced Water Pollution and Sewage Microbiology **3 units**

Advanced studies of microbial communities of natural water, (aquatic ecosystems), methods of determining the numbers and types of bacteria in water. Water borne pathogens, treatment, storage and control of water borne disease. water pollution, treatment of sewage and current trends in industrial wastes handling.

MLS 643 Advanced Systemic Virology **3 units**

Advanced and current trends in diagnostic procedures, pathogenesis, immunology, chemotherapy. Molecular prophylaxis, aspects of virology and epidemiology of viruses of medical importance, current trends in classification, evolution, nature and mutaton of viruses. Vaccine production, emergence of new viral strains.

MLS 644 Advanced Pathogenic Bacteriology **3 units**

Host-parasite relationships, details of the nature, occurrence, distribution, bacteria of medical importance, Virulent factors of pathogenic bacteria, epidemiology etc.

MLS 646 Advanced Medical Mycology **3 units**

Advanced knowledge of the general characteristics of fungi, current trends in classification of fungi, clinical features, and processes in subcutaneous, superficial, cutaneous, deep seated mycoses.

MLS 647 Bacterial Genetics and Genetic Engineering **3 units**

Introduction, molecular basis of genetics, biochemical genetics, crossing over, chromosome studies/ mapping, mutation and mutagenesis, DNA structure and repair, gene and reverse transcriptase. Gene conversion and recombination, regulation of gene expression, mutation, plasmids and phages. Gene cloning, host-vector system, isolation of vector and foreign DNA, formation of recombinant DNA, applications and principles.

MLS 648 Applied Microbiology and Biotechnology**3 units**

Application of micro-organisms in industrial processes, sources, isolation, screening, culture collection and maintenance, large scale cultivation of micro-organisms, design and operation of industrial fermenters, scale up fermentations. Recovery and purifications of microbial products, control alcohol, industrial solvents, antibiotics, vitamins, organic and amino acids, enzymes, vaccines, steroid transformation insecticides, fertilizers, applications of genetic engineering.

MLS 649 Advanced Medical Parasitology**3 units**

Detailed consideration of the nature, occurrence, distribution, mode of infection, isolation and identification of protozoa and trends in cultural techniques, immunology and preservation of parasites. Advanced helminthology etc.

MLS 651 Advanced General Immunology**3 units**

A detailed treatment of the concepts of immunity and immunology, cells and tissues of the immune system structure, function and diversity and production of antibodies, advanced knowledge of cell mediated immunity. Activation of thymus deprived lymphocytes etc. graft rejection cytotoxicity etc. historical approach and immunological theories, immune functions.

MLS 652 Immunochemistry**3 units**

Advanced methods in immunology, historical advances, Ontogeny and phylogeny, non-lymphoid and lymphoid immunity, adaptive immunity, lymphocytes, immunoglobulin, chemistry and relationship to function; allotypes, isotypes, autotypes, immunogenetics, regulation of the immune system, advanced Immunology, immunochemistry and infection etc.

MLS 653 Tumour Immunology**3 units**

Clinical aspects of ecology and the characteristics of malignant cells. Tumour associated antigens and the host response. Animal models, value of tumour markers in diagnosis and disease management, immunoassays, immunocytochemistry, and immunoscintigraphy immunotherapy.

MLS 654 Transplantation Immunology**3 units**

Histocompatibility testing and its relevance to transplantation. The selection, storage and culture of donor issues. Clinical aspects of transplantation, clinical immune-suppression, current practice and future prospects, bone marrow transplantation, Graft versus host disease.

MLS 655 Immunopathology**3 units**

Autoimmunity, genetic and constitutional factors, role of hypersensitivity reactions including immune complexes in the pathology of autoimmune disease. Organ specific and non-organ specific, immunodiagnostic test, processing of biopsies, therapy, classification of hypersensitive reactions, clinical manifestations, prophylaxis, immune deficiencies.

MLS 656 Historical Advances and Immune Cells**3 units**

Historical aspects of immunology including conceptual changes as an introduction to current understanding of immune function, non-adaptive host defence, mechanisms, chemistry, synthesis, genetics and activation of complement, interaction with other biological systems, immunoglobulin, regulation etc.

MLS 657 Methods in Immunology**3 units**

A detailed consideration of the relevant immunology techniques including details of immunoelectrophoresis, immune-fluorescence, immunodiagnosis, serological techniques, etc.

MLS 660 Advanced Public Health Microbiology**3 units**

Introduction to epidemiology, epidemiology, epidemiology of infectious diseases. Infection and disease, signs, symptoms and epidemiology. Descriptive, analytical, statistical applications, experimental methods, sources and reservoirs of infections. Zoonoses, Nosocomial infection, prevention and control of infectious diseases. Immunization, public health services, genetic epidemiology. The ecological approach to health and disease. Applications as control measures, health policy and administration, international health.

MLS 661 Advanced Pharmaceutical Microbiology**3 units**

The chemical basis, classification, modes of action and pharmacokinetics of chemotherapeutic agents and antibiotics. Monitoring drug level in body fluid. Action upon microbial target sites. Mechanisms of resistance, inactivating enzymes, antibiosis, synergism, antagonism, laboratory testing etc.

MLS 662 Advanced Medical Entomology**3 units**

Biology and Life cycle e.g. Arthropods, insect, family, acarines, mollusks, lice and fleas. Disease transmission mechanism and dynamics. Vector-control technique insecticide and molluscicides principle. Techniques in entomology, museum techniques.

Requirements for Graduation

To be awarded Masters degree candidates must pass a minimum of 34 credit units as follows:

- i. Core course of minimum of 18 credit units
- ii. Required courses of a minimum of 8 units
- iii. A student shall present at least 2 seminars in special topics in his area of specialization and shall also submit and defend a research proposal (2 units)
- iv. Each student is expected to carry out a detailed research investigation under a supervisor in his chosen field, write it up as a thesis and be examined before a panel of Chief external Examiner and Internal Examiners in an oral examination (6 credits).

4.0 Ph.D DEGREE PROGRAMME**i. Course Content**

- a) The Ph.D degree programme in Medical Laboratory Sciences shall be undertaken through prescribed courses of not more than 12 credit units for those candidates who may not have taken such courses at the Masters level or who may require some extra knowledge to carry out their Ph.D research.
- b) Doctorate or Ph.D programme should primarily be by research work, presentation of seminars, including research proposal and a final seminar after completion of research. A Ph.D thesis of 12 credit units must be defended before a panel of examiners including an external examiner.

ii. Requirements for Graduation

To be awarded the degree of Doctor of Philosophy in Medical Laboratory Sciences, a candidate must have fulfilled the conditions set by the University and successfully defended his/her thesis and other prescribed requirements.

COURSE WORK FOR Ph.D

COMPULSORY

PGC 701 SYNOPSIS AND GRANT WRITING - 3 Units

Identification of types and nature of grant writing; mining of grant of grants application calls on the internet. Determining appropriate strategy for each grant application. Study of various grant application structures and contents and writing of concept notes, detailed project description, budgeting and budget defense. Study of sample grant writings in various forms and writing of mock research and other grants. Identification of University of Nigeria synopsis structure and requirements, (Introduction, Methodology, and Results). Determining the content of each subunit off the synopsis. Steps in writing of synopsis from the dissertation/thesis document. Structural and language issues. Common errors in synopsis and strategies for avoiding them. The roles of the student and the supervisor in the production of a synopsis. Writing of mock synopsis. All registered Ph.D students must attend a solution-based interactive workshop to be organized by the School of Postgraduate Studies for a practical demonstration and application off the knowledge acquired from the course conducted by selected experts.

SPECIALITIES

CLINICAL CHEMISTRY

MLS 711 Advanced Clinical Chemistry I (4 credits)

Laboratory diagnosis of kidney, cardiac, liver, muscle and hemolytic diseases. Haemoglobinopathies. Instruction includes physiology and pathophysiology in conjunction with laboratory testing for the above diseases. Molecular medicine. Laboratory statistics.

MLS 712 Advanced Clinical Chemistry II (4 credits)

Laboratory investigation of disorders in acid-base balance, lipid and carbohydrate metabolism, and endocrine functions. Biochemical markers of myocardial infarction. Case studies.

MLS 713 Advanced Biochemistry I (4 credits).

Chemistry of proteins, carbohydrates, and lipids; immunology and AIDS. Enzymes and energetics of metabolic reactions. Metabolism of nitrogen-containing compounds, vertebrate metabolism, neurotransmission, nucleotides, and nucleic acids, DNA processes, RNA

synthesis and processing, protein synthesis, gene expression, and cancer (Molecular basis, carcinogenesis, oncogenes, benign and malignant, metastasis, tumor markers etc). Genetic disorders: Down's, Turner's and Klinefelter's syndromes etc. Advanced neurochemistry

MLS 714 Biotechnology Techniques (4 credits).

Techniques of immunoassays and techniques of isolation, manipulation, and analysis of proteins/nucleic acids. Research Techniques: Enzyme assays, enzyme activity and specific activity determination. Cell disintegration and extraction techniques, separation of proteins by fractionation (ammonium sulphate, organic solvents). Ion exchange chromatography, molecular sieve chromatography, affinity chromatography, paper chromatography, thin layer chromatography, ultra filtration, Ultracentrifugation. Gel electrophoresis, isoelectric focusing and immunoelectrophoresis, capillary electrophoresis, pulse field electrophoresis. Microscopy, HPLC, HPTLC, GC-MS, FTIR, SEM/TEM, NMR, AAS. Includes both lecture and laboratory work

MEDICAL MICROBIOLOGY

MLS 741 Gene Technology 4 units

Enzymes: DNA polymerase, restriction endonucleases, topoisomerase I and DNA ligase, reverse transcriptase, kinase, alkaline phosphatase, nuclease, RNase H. Vectors: plasmids;(Ti/Ri), Cosmids, bacteriophage, M13 vectors, BAC, YAC and synthetic plasmids. DNA sequencing dideoxy chain termination and Sanger's +/- method. cDNA library – screening by oligonucleotide probe, nick translation, site directed mutagenesis, linkage analysis. Gene cloning- General strategy for gene cloning, transformation. Application of gene technology, Gene Silencing, Gene knock out and gene therapy

MLS 742 Research Techniques: 4 units

Identification and characterization of DNA, RNA, plasmids. Agarose gel electrophoresis, ethidium bromide staining. Southern, Northern, Western Blotting, RAPD, RFLP, DGGE, TGGE, PCR. Enzyme assay, enzyme activity and specific activity determination. Cell disintegration and extraction techniques, separation of proteins by fractionation (ammonium sulphate, organic solvents). Ion exchange chromatography, molecular sieve chromatography, affinity chromatography, paper chromatography, thin layer chromatography, ultra filtration, Ultracentrifugation. Gel electrophoresis, isoelectric focusing and immunoelectrophoresis, capillary electrophoresis, pulse field electrophoresis. Microscopy, HPLC, HPTLC, GC-MS, FTIR, SEM/TEM, NMR, AAS.

MLS 743 Advanced Medical Microbiology and Immunology 4 units

Immunoprophylaxis and Immunotherapy Regulation of Immune response. Interleukins, Interferon and Lymphokines Recent developments in Monoclonal antibody technology In vitro synthesis of immunoglobulins, complement and other proteins. Rapid Detection of Food borne Pathogenic Bacteria Pathophysiology of Infectious diseases – diseases of respiratory tract, digestive system, skin and soft tissues. Molecular basis of Mycoplasma pathogenicity, AIDS associated Mycoplasma. Recent developments in aetiology, pathogenesis, diagnosis and control of AIDS

HAEMATOLOGY AND BLOOD TRANSFUSION SCIENCE

MLS 721 Molecular and Cellular Haematology 4 units

Genetic principles and molecular biology. Genomics and epigenetics. Cytogenetics and Molecular abnormalities. Apoptosis. Cell Cycle Regulation and haematological disorders. Signal transduction pathways. The cluster of differentiation antigens. Haematopoietic stem cells, Progenitors, and cytokines. The inflammatory response. Innate Immunity, Dendritic cells and the control of innate and adaptive immunity.

MLS 722 Neoplastic Myeloid Diseases 4 units

Classification and clinical manifestations of the clonal Myeloid disorders. Polycythaemia vera. Essential thrombocytopaenia. Myelodysplastic syndromes. Acute and chronic myelogenous leukaemia. Primary myelofibrosis. Case studies

MLS 723 Transfusion Medicine 4 units

Erythrocyte antigens and antibodies. Human leucocyte and platelet antigens. Blood procurement and screening. Red cell transfusion. Preservation and clinical use of platelets. Blood products/fractions

HISTOPATHOLOGY UNIT

MLS 731 Advanced systematic pathology

General review of systems; respiratory, growth, nervous, renal, genital, cardiovascular; vital organs, liver, pancreas, gall bladder, and lymphoid organs, tumours and malignancies, tissues culture.

MLS 732 Applied histochemistry/Cytochemistry

Immunofluorescence techniques, Polymerase Chain Reaction, Enzyme studies, Review of Laboratory staining procedures. Hormones in cytology, designs of experimental procedures; electron microscopy.

MLS 733 Slide reading/Photomicrography

Review of normal and pathological tissue slides of general and special stains.