**Bayero University, Kano**

**College of Health Science**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

**Proposed 30% addition to the CCMAS Course Structure /Summary**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **100 LEVEL** | | | | | |
| **Course Code** | **Course Title** | **Unit(s)** | **Status** | **LH** | **PH** |
| BUK-MTH 101 | Mathematics for Health Sciences | 3 | C | 45 | -- |
| BUK-COS 101 | Introduction to Computer Sciences | 3 | C | 30 | 45 |
|  | **Total** | **6** |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **200 LEVEL** | | | | | |
| **Course Code** | **Course Title** | **Unit(s)** | **Status** | **LH** | **PH** |
| BUK-MLS 201 | History of Medical Laboratory Science | 2 | C | 30 | --- |
| BUK-MLS 202 | Introduction to Biology of Diseases | 2 | C | 15 | 45 |
|  | **TOTAL** | **4** |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **300 LEVEL** | | | | | |
| **Course Code** | **Course Title** | **Unit(s)** | **Status** | **LH** | **PH** |
| BUK-MLS 301 | Molecular Biology and Microbial Genetics | 2 | C | 15 | 45 |
| BUK-MLS 302 | Forensic Science | 2 | C | 15 | 45 |
| BUK-MLS 303 | Medical Laboratory Bio-risk Management | 2 | C | 30 | -- |
| BUK-MLS 304 | Bio-manufacturing and Invitro-diagnostic  Reagents | 2 | C | 15 | 45 |
| BUK-MLS-305 | General Pharmacology | 2 | C | 15 | 45 |
| BUK-MLS-306 | Systemic Pharmacology | 2 | C | 15 | 45 |
| BUK-MLS 307 | General Pathology | 3 | C | 30 | 45 |
|  | **TOTAL** | **15** |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **400 LEVEL** | | | | | |
| **Course Code** | **Course Title** | **Unit(s)** | **Status** | **LH** | **PH** |
| BUK-GST401 | Character Building, Professionalism and Team Work in Healthcare | 2 | C | 30 | -- |
| BUK-MLS 401 | Medical Laboratory Supply Chain Management | 2 | C | 30 | -- |
| BUK-MLS 402 | Molecular Diagnostics and Bioinformatics | 3 | C | 30 | 45 |
| BUK-MLS 403 | Immunology I | 2 | C | 15 | 45 |
| BUK-MLS 404 | Tissue Slide Reading and Reporting | 2 | C | 15 | 45 |
| BUK-MLS 405 | Special Topics in Clinical Chemistry | 2 | C | 15 | 45 |
| BUK-MLS 406 | First Professional Examination | 3 | C | -- | 135 |
|  | **TOTAL** | **16** |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **500 LEVEL** | | | | | |
| **Course Code** | **Course Title** | **Unit(s)** | **Status** | **LH** | **PH** |
| BUK-MLS 501 | Clinical Chemistry III | 2 | C | 15 | 45 |
| BUK-MLS 502 | Modern Trend in Haematological Techniques | 2 | C | 15 | 45 |
| BUK-MLS 503 | Histopathology III | 2 | C | 15 | 45 |
| BUK-MLS 504 | Immunology II | 2 | C | 15 | 45 |
| BUK-MLS 505 | Public Health and Field Epidemiology | 3 | C | 15 | 90 |
| BUK-MLS 506 | Final Professional Examination | 3 | C | -- | 135 |
| BUK-MLS 507 | Medical Microbiology III | 2 | C | 15 | 45 |
|  | **TOTAL** | **16** |  |  |  |
|  | **GRAND TOTAL** | **53** |  |  |  |

**Bayero University, Kano**

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

Senate – approved relevance to mission, vision, strategic goals, uniqueness and contextual peculiarities of the university. Training of well-skilled graduates that can apply the knowledge gained in Elementary mathematics for generating and presenting data, analyzing problems involving integration, differentiation using different methods and evaluate simple biostatical problems in other related courses. This is consistent with the university's vision and mission of providing leadership in research and education in Africa which is intended to develop graduates who are effective communicators, critical thinkers, and skilled at integrating evidence into practice.

**Overview**

The course examines the elementary set theory, subsets, union, intersection, complements, Venn diagram, real numbers and integers. This course will cover rational and irrational numbers, real sequences, series, theory of quadratic equations, binomial theorem, circular measures, trigonometric functions of angles of any magnitude. Students will learn how to evaluate quadratic equations and trigonometric functions, analyse problems involving rational and irrational numbers, Real sequences and solve mathematical problems in other related courses.

The course will also examine identify and describe data in graphs and charts, analyse problems involving integration and differentiation using different methods and the applications in areas and volumes. Additionally, students will learn how to solve simple biostatical problems in other related courses. The objectives of the course, learning outcomes, and contents are provided to address this need.

**Objectives:**

The objectives of the course are to:

1. Discuss, identify and solve problems involving Set, Subset, Union, Intersection, Complements and use of Venn diagrams
2. Evaluate quadratic equations and trigonometric functions
3. Analyze problems involving rational and irrational numbers, Real sequences and series
4. Solve mathematical problems in other related courses
5. Identify and describe data in graphs and charts
6. Analyze problems involving integration and differentiation using different methods and discuss the applications in areas and volumes
7. Evaluate simple biostatical problems in other related courses

**Learning Outcomes**

On completion of the course, students should be able to:

1. Explain basic definitions of and solve problems involving Set, Subset, Union, Intersection, Complements and use of Venn diagrams,
2. Solve quadratic equations and trigonometric functions
3. Solve problems involving rational and irrational numbers, Real sequences and series
4. Translate the knowledge gained by solving mathematical problems in other related courses 5.
5. Present and describe data in graphs and charts
6. Define and solve problems involving integration, differentiation using different methods and explain the applications in areas and volumes
7. Translate the knowledge gained by solving simple biostatical problems in other related courses

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. .

**Bayero University, Kano**

**Faculty of Allied Health Science**

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**B.MLS. Medical Laboratory Science**

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

**Senate approved relevance**

Training of well-skilled graduates that can apply the knowledge gained in computer sciences for generating and presenting data, analyzing problems. This is consistent with the university's vision and mission of providing leadership in research and education in Africa which is intended to develop graduates who are effective communicators, critical thinkers, and skilled at integrating evidence into practice.

**Overview**

The course describes application of computer in general sciences. This includesthe use of computers for basic research, browsing of the internet, education/learning, research, simulation, accessing libraries, soft wares, statistical packages and spreadsheets.

This course will provide overview and comprehensive understanding of computer application in sciences in general with the aim of enhancing learning and offering efficient computer experience. The objectives of the course, learning outcomes, and contents are provided to address this need.

**Objectives**

The objectives of the course are to:

1. state the basic components of computers and other computing devices;

2. describe the various applications of computers;

3. explain information processing and its roles in the society;

4. describe the Internet, its various applications and its impact;

5. explain the different areas of the computing discipline and its specialisations; and

6. demonstrate practical skills on using computers and the internet.

**Learning Outcomes**

At the end of the course, students should be able to:

1. mention the basic components of computers and other computing devices;

2. describe the various applications of computers;

3. explain information processing and its roles in the society;

4. describe the Internet, its various applications and its impact;

5. explain the different areas of the computing discipline and its specialisations; and

6. demonstrate practical skills on using computers and the internet.

**Course content**

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 specialisations 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 materials.

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

**Senate Approved Relevance**

Graduates who are highly knowledgeable in the evolution of Medical Laboratory Science with global appreciation is in accord with BUK vision and mission to be a world class university in producing BMLS graduates who are leaders in laboratory diagnosis of diseases and can work anywhere in the world.

**Overview**

This course is intended to provide theoretical and practical view about the evolution of medical laboratory science in Nigeria including international contribution for moral and professional appreciation.

This course will expose students to the evolution of Medical Laboratory Science practice, legislations pertaining to Medical Laboratory Science practice in Nigeria, nomenclature of the certificates, diploma and degrees awarded at different times, the rules and regulations governing training of Medical Laboratory Scientists, procedure involved in programme approval and accreditation, the requirements expected of a Medical Laboratory Scientist to be a member and chairman of MLSCN board, indexing, induction and internship procedures and the challenges and Prospects of Medical Laboratory Science Education in Nigeria.

**Course objectives**

The objectives of this course are to**:**

* 1. explain the evolution of medical laboratory science practice
  2. describe the legislations pertaining to medical laboratory science practice in Nigeria
  3. describe nomenclature of the certificates, diploma and degrees awarded at different times
  4. describe the rules and regulations governing training of medical laboratory scientists
  5. explain the procedure involved in programme approval and accreditation
  6. explain the requirements expected of a Medical Laboratory Scientist to be a member and chairman of MLSCN board
  7. describe indexing, induction and internship procedures
  8. describe the challenges and Prospects of Medical Laboratory Science Education in Nigeria

**Learning Outcomes**

At the end of this course, the students should be able to:

* + 1. explain the evolution of medical laboratory science practice
    2. describe the legislations pertaining to medical laboratory science practice in Nigeria
    3. identify and interpret the nomenclature of the certificates, diploma and degrees awarded at different times
    4. state the rules and regulations governing training of medical laboratory scientists
    5. describe the procedure involved in BMLS programme approval and accreditation
    6. state the requirements expected of a Medical Laboratory Scientist to be a member and chairman of MLSCN board
    7. state procedures for indexing, induction and internship
    8. state 10 challenges and 10 Prospects of Medical Laboratory Science Education in Nigeria

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. .

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

**Senate Approved Relevance**

Graduates who are highly knowledgeable in Biology of Diseases for application in laboratory procedures and in the quality control as it affects the quality control of the laboratory diagnosis of diseases is in accord with BUK vision to be a world class university in producing BMLS graduates who are leaders in laboratory diagnosis of diseases and can work anywhere in the world.

**Overview**

This course will provide general knowledge on biology of diseases for application in the laboratory diagnosis of diseases for qualitative healthcare management of illness.

The course will enable student to acquire quality knowledge on the basis of cell in life and disease, primary causes of disorder, cardinal signs of inflammation, immunity and immune disorders and agents of infectious and non-infectious diseases.

**The objectives of this course are to:**

1. explain the basis of cell in life and disease
2. describe the primary causes of disorder
3. describe the cardinal signs of inflammation
4. explain the immunity and immune disorders
5. describe agents of infectious and non-infectious diseases

**Learning Outcomes**

At the end of this course, the students should be able to:

* + - 1. know the basis of cell in life and disease
      2. describe the primary causes of disorder
      3. describe the cardinal signs of inflammation
      4. know the normal flora and natural body defence mechanism
      5. know the agents of infectious and non-infectious diseases

**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).

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories, Microscopes and Water bath with a capacity of 100 students.

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

**Senate approved relevance**

Producing high quality graduates who are highly skilled, experienced and knowledgeable in Molecular Biology and Microbial Genetics is in accord with BUK vision to be a world class university in producing BMLS graduates who are leaders in molecular diagnosis of diseases and can work anywhere in the world.

**Overview**

Molecular Biology is the branch of biology that studies the molecular basis of biological activity. Molecular Biology and Microbial Genetics is to provide laboratory diagnostic solutions to emerging and re-emerging infectious diseases. Living things are made of chemicals just as non-living things are, so this course will give the students the basic knowledge on how molecules interact with one another in living organisms to perform the functions of life.

Knowledge on the structure, function, processing, regulation and evolution of biological molecules and their interactions with one another (providing micro-level insights into how life works) would be provided. Although there are many kinds of molecules in every living thing, this course will focus on genes and proteins in both eukaryotic and prokaryotic cells. Proteins perform a huge diversity of functions within living cells and genes contain the information required to make more proteins.

**Objectives**

The objectives of this course are:

1. describe the structures and functions of DNA, RNA and proteins
2. explain the genome organization of prokaryote and eukaryote
3. explain the biological events in DNA replication and gene expression
4. describe the types and outcomes of mutation
5. describe DNA recombination and its applications in genetically modified organisms
6. demonstrate basic molecular biology techniques such as DNA extraction and electrophoresis

**Learning Outcomes**

At the end of the course, students should be able to:

1. describe the structures and functions of DNA, RNA and proteins
2. understand the genome organisation of prokaryote and eukaryote
3. explain the biological events in DNA replication and gene expression
4. describe the types and outcomes of mutation
5. explain DNA recombination and its applications in genetically modified organisms
6. carry out some basic molecular biology techniques such as DNA extraction and electrophoresis

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories, Microscopes, Centrifuge, weighing balance, Electrophoresis machine, Electrophoresis tank, incubator and Water bath with a capacity of 100 students

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

**Senate approved relevance**

Producing high quality graduates who are highly skilled, experienced and knowledgeable in forensic science is in accord with BUK vision to be a world class university in producing BMLS graduates who are leaders in forensic analysis and diagnosis of criminal and disputes and who can work anywhere in the world.

**Overview**

This course is intended to provide theoretical and hands on skills at identifying disputes and criminal acts and provide resolution, safety and preventive measures in our locality and the country at large. Previews of analytical techniques in chemistry and biology that is so critical in forensic science.

Students will be exposed to sophisticated analytical instruments such as chromatography, nuclear magnetic resonance spectroscopy, and mass spectrometry. Knowledge on biological profiling, introductory toxicology, physical examination of evidence, specific aspects of forensic science such as legal issues and forensic case study will be discussed. It will expose students to the concept of forensic, safety and biosecurity learn about handling of clinical samples, state mitigating measures against the biosecurity procedures.

**Learning Objectives students are expected to;**

1. learn the important of security and their impact on environmental protection

2. know the common field tools in forensic study

3. know how to apply the basic technique in basic toxicology

4. be able to apply biological profiling and legal issue

5. have in-depth knowledge in disputes and criminal acts resolutions

**Learning Outcomes**

1. discuss security and environmental protection

2. discuss the common field tools in forensic study

3. ability to apply the basic technique in basic toxicology

4. discuss biological profiling and legal issue

5. apply the knowledge in disputes and solving criminal acts

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, Tissue Processing Machine, Dissecting tools, PCR Machine, Electrophoresis machine, Electrophoresis tank, Incubator, Biosafety Cabinets, Gel Documentation Unit and Water bath.

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

**Senate Approved Relevance**

Graduates who are highly skilled and knowledgeable in identifying risks and apply preventive measure with global acceptance is in accord with BUK vision and mission to be a world class university in producing BMLS graduates who are leaders in laboratory diagnosis of diseases and can work anywhere in the world.

**Overview**

This course is intended to provide theoretical and hands on skills at identifying bio risks/hazards and provide biosafety/preventive measures. It will expose students to concept of bio-risk, biosafety and biosecurity, bio-risk management differentiate between biosafety and biosecurity, describe biological risks in the laboratory, categorize bio-risks arising from handling clinical samples, state mitigating measures against the risk, describe biosafety procedures and describe biosecurity procedures.

**Objectives**

The objectives of this course are to:

1. explain concept of biorisk, biosafety and biosecurity
2. describe bio-risk management
3. differentiate between biosafety and biosecurity
4. describe biological risks in the laboratory
5. categorize Biorisks arising from handling clinical samples
6. state mitigating measures against the risk
7. describe biosafety procedures
8. describe biosecurity procedures

**Learning Outcomes**

At the end of this course, the students should be able to:

* 1. define biorisk, biosafety and biosecurity
  2. describe the management of 5 medical laboratory bio-risks
  3. state 5 differences between biosafety and biosecurity
  4. describe 10 biological risks in a laboratory
  5. categorize Biorisks arising from handling 4 major types of clinical samples
  6. state 5 mitigating measures against biological risks
  7. describe 10 biosafety procedures
  8. describe 10 biosecurity procedures

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Biosafety cabinet (different type) and Incinerators.

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

**Senate Approved Relevance**

Graduates who are highly skilled and knowledgeable in of Bio-manufacturing of Chemicals and Diagnostic Reagents which is in line with the MLSCN act of 2003 which was not covered by the former curriculum is in accord with BUK vision and mission to be a world class university in producing BMLS graduates who are leaders in the production of Biologicals, chemicals and reagents used in the laboratory for diagnosis of diseases and can work anywhere in the world.

**Overview**

This course will provide skills at the production of Biologicals, chemicals and diagnostic reagents for the purpose of laboratory diagnosis and for students to be self-reliant. This course will provide basic and advanced knowledge to generate a procedure for the production of at least one biological/reagent in each of the 4 special areas, produce at least one reagent/biological in two different special areas.

The course also aims to help students carry out quality control and validation of the ingredients required for the production of laboratory Biologicals and diagnostic reagents, carry out quality control and validation for at least 2 laboratory biological and diagnostic reagent products, package and label at least 2 laboratory Biologicals and diagnostic reagent products, carry out quality control and standardization 2 laboratory Biologicals and diagnostic reagent products and demonstrate laboratory waste disposal.

**Course Objectives**

**The objectives of this course are to:**

1. utilize basic and advanced knowledge to generate a procedure for the production of at least one biological/reagent in each of the 4 special areas
2. produce at least one reagent/biological in two different special areas
3. carry out quality control and validation of the ingredients required for the production of at least 2 laboratory Biologicals and diagnostic reagents
4. carry out quality control and validation for at least 2 laboratory biological and diagnostic reagent products
5. package and label at least 2 laboratory Biologicals and diagnostic reagent products
6. carry out quality control and standardization 2 laboratory Biologicals and diagnostic reagent products
7. demonstrate laboratory waste disposal

**Learning Outcomes**

At the end of this course, the student should be able to:

* 1. utilize basic and advanced knowledge to generate a procedure for the production of at least one biological/reagent in each of the 4 special areas
  2. produce at least one reagent/biological in two different special areas
  3. carry out quality control and validation of the ingredients required for the production of at least 2 laboratory biologicals and diagnostic reagents
  4. carry out quality control and validation for at least 2 laboratory biological and diagnostic reagent products
  5. package and label at least 2 laboratory Biologicals and diagnostic reagent products
  6. carry out quality control and standardization 2 laboratory Biologicals and diagnostic reagent products
  7. demonstrate laboratory waste disposal

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, PCR Machine, Electrophoresis machine, Electrophoresis tank, Incubator, Biosafety Cabinet, Gel Documentation Unit and Water bath.

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

**Senate Approved Relevance**

Graduates who are highly skilled and knowledgeable in advanced laboratory medicine is in accord with BUK vision to be a world class university in producing BMLS graduates who are leaders in laboratory diagnosis of diseases and can work anywhere in the world.

**Overview**

Pharmacology is the study of substances that interact with living systems through chemical processes. Pharmacology is also important for health sciences students in view of its detailed knowledge transfer even at molecular levels. It aims to teach the mechanism involved in the binding of drugs to regulatory molecules which leads to either activating or inhibiting normal body processes. This course involves the quantitative analysis of the processes of drug absorption, distribution, and elimination that determine the time course of drug action. It deals with the mechanism of drug action.

This course will equip the medical laboratory scientist with the requisite knowledge needed to understand how therapeutic chemical substances influence human functioning in the presence or absence of pathological process. Students are to understand the impact of some medications to outcomes of physiotherapy care.

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**Learning Objectives**

The objectives of this course are to:

* + - 1. describe the origin and sources of drugs
      2. acquire knowledge on the routes of administration of drugs,
      3. understand pharmacokinetics
      4. know about mode of action of drugs.
      5. Know the types of drug action
      6. explain drug toxicity and adverse drug reactions.
      7. differentiate drug dependence and drug interactions

**Learning Outcome**

At the end of this course, students should be able to:

* + - 1. explain the origin and sources of drugs
      2. explain the routes of administration of drugs,
      3. explain d pharmacokinetics
      4. explain the mode of drug action.
      5. explain the types of drug action
      6. explain drug toxicity and adverse drug reactions.
      7. differentiate drug dependence and drug interactions

**Course content**

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 tachyphiaxis. Effects of diseases. Drug toxicity. Adverse drug reactions. Drug dependence and drug interactions.

**Minimum Academic Standards**

As contained in the NUC MASAvailability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, Incubator, Biosafety Cabinet and Water bath. Laboratory animals, animal cages and animal waste disposal tank.

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

**Senate Approved Relevance**

Graduates who are highly skilled and knowledgeable in advanced laboratory medicine is in accord with BUK vision to be a world class university in producing BMLS graduates who are leaders in laboratory diagnosis of diseases and can work anywhere in the world.

**Overview**

Pharmacology is the study of substances that interact with living systems through chemical processes. Pharmacology is also important for health sciences students in view of its detailed knowledge transfer even at molecular levels. It aims to teach the mechanism involved in the binding of drugs to regulatory molecules which leads to either activating or inhibiting normal body processes.

This course involves the quantitative analysis of the processes of drug absorption, distribution, and elimination that determine the time course of drug action. It deals with the mechanism of drug action.

**Learning Objectives**

The objectives of this course are to:

learn drugs mechanism of action in specific diseases.

learn drugs mechanism of action in specific organs.

learn drugs mechanism of action in neuroscience. immunology, microbiology and oncology.

carryout practical components.

learn drug–receptors interactions.

understand pharmacologic effect.

learn agonist and antagonist.

**Learning Outcome**

At the end of this course, students should be able to:

describe the drugs mechanism of action in specific diseases.

explain drugs mechanism of action in specific organs.

explain drugs mechanism of action in neuroscience. immunology, microbiology and oncology.

carryout practical components.

explain drug–receptors interactions.

explain pharmacologic effects of drug.

learn agonist and antagonist

acquire the knowledge and skills in the clinical application of these principles, particularly in the management of patients.

explain basic approaches used in drug evaluation and the techniques for monitoring drugs in patients for therapeutic effectiveness and adverse effects.

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, Incubator, Biosafety Cabinet and Water bath. Laboratory animals, animal cages and animal waste disposal tank.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Graduates who are highly skilled and knowledgeable in advanced laboratory medicine is in accord with BUK vision to be a world class university in producing BMLS graduates who are leaders in laboratory diagnosis of diseases and can work anywhere in the world.

**Overview**

General Pathology will provide a post-basic knowledge in ancient, traditional and modern concept of diseases and their causes. It provides knowledge on t as well as disturbances of cell growth.

It will also address issues on immunopathology, oedema, embolism, thrombosis and shock, mechanisms and pathogenesis underlying oedema, embolism, thrombosis and shock, morphologic and clinical features of oedema, embolism, thrombosis, shock, types of pathologic calcification, fatty change and cellular accumulations of protein, glycogen and pigments; and management of infectious diseases.

**Learning Objectives**

The objectives of this course are to:

* + 1. explain immunopathology
    2. describe oedema, embolism, thrombosis and shock;
    3. explain pathophysiologic mechanisms and pathogenesis underlying oedema, embolism, thrombosis and shock;
    4. describe morphologic and clinical features of oedema, embolism, thrombosis, shock;
    5. describe types of pathologic calcification;
    6. explain fatty change and cellular accumulations of protein, glycogen and pigments; and
    7. describe management of infectious diseases.
    8. describe chemical, radiation and microbial carcinogenesis
    9. describe infectious diseases.

**Learning Outcomes**

At the end of this course, students should be able to:

1. explain immunopathology
2. define oedema, embolism, thrombosis and shock;
3. explain pathophysiologic mechanisms and pathogenesis underlying oedema, embolism, thrombosis and shock;
4. describe morphologic and clinical features of oedema, embolism, thrombosis, shock;
5. list types of pathologic calcification;
6. explain fatty change and cellular accumulations of protein, glycogen and pigments; and
7. explain management of infectious diseases
8. explain chemical, radiation and microbial carcinogenesis
9. explain infectious diseases

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, Incubator, Biosafety Cabinet and Water bath. Tissue processor, Dissecting tools, Slide and cover glass.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate approved relevance**

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| --- |
| This course is designed in line with the vision and mission of the Bayero University, Kano to produce graduates that are highly qualified with excellent knowledge and high proficiency in skills capable of delivering excellent, respectful, empathic and culturally attuned healthcare services to society devoid of exploitation. The character, professional outlook as well as the work ethics of the graduates would be sharpened by the course to achieve this goal.This course would further strengthen the graduates to work as a team in the health sector to achieve the desired objectives. It should encourage individual members’ professional development through appropriate mentorship and character building. The course will discourage the development of the barrage of emerging 21st century societal vices inclusive of, but not limited to drug and substance abuse. In essence the course would entrench the humane and professional aspects of the graduates as they serve the society equipped with knowledge and skills consistent with the vision and mission of the Bayero University, Kano.  **Overview** |
| A major life expectation of the graduates from this programme is the deployment of their services to a variety of clients including students, colleagues and vulnerable groups in the Nigerian milieu and beyond. Graduates of this programme, working with others, would also be expected to research into, propose, design and implement programmes, working with others, would research into, propose, design and implement policies and legislations in many areas of need to enhance better societal outcomes in health and education.  Accordingly, this course would prepare graduates from this programme to deploy their expertise in knowledge, skills, professionalism and work ethics in a culturally accepted manner, in the various services they offer to a variety of clients in healthcare, academia and other fields of endeavour.  In addition, the students will be exposed to communication and counselling skills that are consistent with the various cultural milieus of practice that they are likely to encounter. Furthermore, it will enhance the collaborative nature of the work they would be involved in post-qualification. The students would be exposed to nature of successful team work, appropriate leadership styles, mentorship and character-buildingskills and ways of refraining from societal vices such as drug and substance abuse.  **Objectives:**  The objectives of this course are to:   1. describe various types of leadership styles applicable in clinical and academic settings. 2. equip students with various skills of mentoring in clinical and academic settings. 3. enumerate the characteristics of a successful team in achieving team objectives. 4. describe the roles of professionalism in various fields of healthcare delivery. 5. describe the principles and practice of psychology in healthcare settings. 6. describe the principles of effective communication for the patients, healthcare team and the general public. 7. discuss the essentials of successful character building for various personality traits. 8. describe the general principles of ethics in medicine and health care research. 9. identify the risk factors and preventive strategies for substance abuse.   **Learning Outcomes:**  At the end of the course, the students should be able to:   1. identify at least three common types of leadership styles with two merits and demerits of each. 2. discuss any two theories of leadership that could be applied in healthcare. 3. identify at least three mentoring skills needed by all healthcare professionals. 4. enumerate four attributes of a successful team. 5. mention five circumstances where professionalism is required to meet client needs and expectations. 6. discuss human behaviour and its application in health counselling. 7. conduct three counselling sessions in three recognised clinical scenarios. 8. demonstrate effective communication skills in dealing with clients, and the general public in recognised clinical scenario. 9. enumerate four forms of character traits each for three personality types. 10. mention four ethical challenges and four appropriate ethical principles to address them in a clinical practice and research. 11. enumerate four preventive strategies to address three forms of drug abuse. |

**Course content:**

Concept of leadership and meaning of leaders. Theories, principles and styles of leadership. Methods of developing team wisdom. Team work 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.

**Minimum Academic standards requirements:**

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| A lecture hall with a minimum seating capacity of fifty students with a projector and flip chart. |

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

**BUK-MLS 401: Medical Laboratory Management and Supply Chain (2 Units Core: LH 30; PH-00)**

**Senate-Approved Relevance**

Graduates who are highly skilled and knowledgeable in Medical Laboratory Management and Supply Chain is in accord with BUK vision to be a world class university in producing BMLS graduates who are leaders in Medical Laboratories and can manage medical laboratory supply chain and can work anywhere in the world.

**Overview**

Medical Laboratory management involves the coordination and integration of resources to accomplish specific results. It is a process of efficiently getting activities completed with and through other people. Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement and all logistics management activities. Supply chain management also provide knowledge on how to plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers’ requirement.

Logistics management is an integrating function, which coordinates and optimizes all logistics activities, as well as integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. Thus this course will provide a requisite knowledge to the students on the task to be performed for the delivery of quality care services as well as improvement on the routine laboratory management services. The content of the course will afford the students the opportunities to analyze and laboratory quality data to achieve optimum improvement.

**Objectives**

The objectives of this course are to:

1. define logistics and why logistics is important for all health programs and purpose of a logistics system
2. differentiate components of a logistics system and how they fit together and purpose of a logistics management information system
3. purpose of the three types of logistics records and the data they must contain and purpose of reporting
4. types of logistics reports and the data they must contain and purpose of logistics feedback reports
5. purpose of an inventory control system and how to select the type of max-min inventory control system to implement

**Learning Outcomes**

At the end of the course, students should be able to:

1. coordinate laboratory activities using the available resources in order to accomplish a specific goals and objectives
2. acquire knowledge required to manage health commodities in the Nigeria public health system
3. integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology
4. sharpen students’ skills to perform post-graduation logistics activities relevant to medical laboratory specialization
5. discuss the role of supply chain in the delivery of quality diagnostics services.

**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 to 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

**Minimum Academic Standards**

As contained in the NUC MAS. .

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Graduates who are highly skilled and knowledgeable in Molecular Diagnostics and Bioinformatics is in accord with Bayero University Kano vision to be a world class university in producing BMLS graduates who are leaders in Molecular Diagnostics and Bioinformatics and can work anywhere in the world.

**Overview**

Molecular Diagnostics and Bioinformaticsis to provide skills and knowledge on the applications of molecular techniques and bioinformatics.

The course is to equip graduates with skills and knowledge of Molecular Diagnostics and Bioinformatics in the basic concepts of polymerase chain reaction, the basic concepts of sequencing technologies, navigate, mine and store biological data in selected data bases, the basic concepts and uses of some bioinformatics/computational biology tools and forensic science.

**Objectives**

The objectives of this course are to:

1. describe the basic concepts of polymerase chain reaction
2. describe the basic concepts of sequencing technologies
3. navigate, mine and store biological data in selected data bases
4. discuss the basic concepts and uses of some bioinformatics/computational biology tools
5. describe the process of primer design

**Learning Outcomes**

At the end of the course, students should be able to:

* + - 1. describe the basic concepts of polymerase chain reaction
      2. describe the basic concepts of sequencing technologies
      3. navigate, mine and store biological data in selected data bases
      4. discuss the basic concepts and uses of some bioinformatics/computational biology tools
      5. explain the process of primer design

**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, PlasmoDB 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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, PCR Machine, Electrophoresis machine, Electrophoresis tank, Incubator, Biosafety Cabinet, Gel Documentation Unit and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate approved relevance**

Train medical laboratory science graduates with a comprehensive knowledge of immunological processes on the individual’s functional abilities and limitations, to provide effective basic immunological knowledge for better understanding of disease to improve diagnosis services to healthcare users in the state and country at large. This is consistent with the university's vision and mission of providing leadership in research and education in Africa while also addressing African development challenges through cutting-edge research, knowledge transfer, and the training of high-quality graduates.

**Overview**

Immunological knowledge provide basis to the essential nature of disease, especially changes in body cells, tissues and organs that are caused by a disease condition. describe the cell-mediated reactions, understand the complement system, processes of its activation and abnormalities. It defines auto immunity and development of auto immune diseases, outlining hypersensitivity reactions, immunosuppression and immunodeficiency diseases, mechanism of immunosuppression diseases, concept of immunity and infections, mechanism in tissue damage diseases.

The course also aims to offer assessment of cellular immune functions, diagnostic tests for assessing cellular immune functions introductory aspect of principles of vaccination and immunization. It also describes the progression of each pathologic process on both its cellular level and clinical presentation whenever signs and symptoms are manifested.

**Objectives**

The objectives of this course are to:

1. be able to describe the cell-mediated reactions
2. describe the complement system, processes of its activation and abnormalities.
3. define auto immunity and development of auto immune diseases
4. outline hypersensitivity reactions
5. know the list of immunosuppression and immunodeficiency diseases
6. describe mechanism of immunosuppression diseases
7. explain the concept of immunity and infections
8. be able to describe the mechanism in tissue damage diseases
9. give assessment of cellular immune functions
10. be able to give an account on the diagnostic tests for assessing cellular immune functions
11. know the principles of vaccination and immunization

**Learning Outcomes**

At the end of this course, students should be able to:

1. describe the cell-mediated reactions
2. explain the complement system, processes of its activation and abnormalities.
3. define auto immunity and development of auto immune diseases
4. outline hypersensitivity reactions
5. list immunosuppression and immunodeficiency diseases
6. describe mechanism of immunosuppression diseases
7. explain the concept of immunity and infections
8. describe the mechanism in tissue damage diseases
9. discuss the assessment of cellular immune functions
10. state diagnostic tests for assessing cellular immune functions
11. state principles of vaccination and immunization.

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, Incubator, Biosafety Cabinet and Water bath. ELISA machine, Washer and ELISA reader.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate –Approved Relevance**

Produced killed personalexperiencedandknowledgeable in processing tissue sample and body fluid from sample collection, physical examination,processing, slide production, and slidereporting. There are many discrepancies in reporting tissue slide and body fluids cytology due to variation inknowledge, technical expertise, including processing, reactions, and in-depth knowledge of tissue and cell pathology. Specialconcern is seen from BUK to tackle the menace of poor performance in histopathology and cytopathology diagnosis by creating a course and ensuring its effective teaching and learning

**Overview**

In most of our general hospital, Histopathology and cytopathology, used to be a major challenge due to lack of manpower who can process Histopathology and cytopathology samples screen and report. Hence, effort to improve our secondary health care facility through Pap smear screening and other cyto- pathological investigation is just necessary in order to reduce maternal mortality rate. Content of this course will prepare the student for effective processing, screening and reporting of cytological slide and some Histopathological samples.

There is serious challenge especially in reading cervical cancer screening slides in our secondary health facility nationwide. Therefore, this course is design to improve student perception, attitude, experience, in processing and reporting cytological samples, and Histopathology processing and screening. This will in turn have a positive effect on our community health and reduces the burden of maternal mortality rate and mortality due to other cancers. The importance of this course lies in achieving sustainable development goals in areas of community health and laboratory medicine.

**Objectives of the Course**

The objectives of this course are to:

1. explain concepts of Histopathological and cytological diagnosis
2. define different classes of Malignancy
3. understand different cytological sign of malignancies
4. adopt panel of techniques for organ type
5. describe Cancer classification and its peculiarities
6. explain Immunological activity of each cancer type

**Learning Outcomes**

On Completion of the course the student should be able to:

1. write the fundamentals concepts of histopathology and Cytopathology Diagnosis
2. define the term malignancy and **its** classification
3. identify fundamentals sign of Malignancies
4. identify Panel of techniques for cancer specific
5. identify organ specific techniques
6. write fundamentals of immunological reactions to Cancer type

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, Tissue processor,slides, cover glass, Incubator, Biosafety Cabinet Water bath and Hot plate.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate –Approve Relevance**

Training of highly qualified graduates who can efficiently provide excellent and evidence-based research and diagnostic services to clients with wider disease spectrum of both communicable and non-communicable diseases through diagnostic application of the knowledge gained of the connections between the two extreme ages, pregnancy, renal function and blood pressure control, chronic kidney disease and the risk of stroke; Diabetes as a risk for both kidney disease and stroke. This is in-line with the mission and vision of Bayero University Kano of addressing African development challenges through cutting-edge research, knowledge transfer and the training of high-quality graduates.

**Overview**

The students will be introduced to the technical aspect of result **i**nterpretation of data generated in clinical chemistry, establishing and use of reference ranges, analysis and preservation of some rare specimen in clinical chemistry. Students will be exposed to the current trend in cancer diagnosis through tumour markers.

Pregnancy and its disorders including maternal and fetal health assessment, complication of pregnancy, maternal serum-screening for foetal defects and overview of laboratory tests in pregnancy will be treated. Clinical chemistry of paediatric and geriatrics as two extreme ages and their laboratory screening methods, inborn error of metabolism, therapeutic drug monitoring, reproductive disorders and infertility will also be introduced.

**Learning objectives**

The objectives of this course are to

* + - 1. should be able to interpret clinical laboratory generated results
      2. should understand the influence of extreme ages and the associated complications and diagnosis
      3. can explain the concept of drug monitoring in special cases of chemotheraphy
      4. should understand the disorders associated with human reproduction and infertility
      5. can explain the basis of establishing reference ranges, interpret and apply in routine conditions

**LearningOutcomes**

On Completion of the course the student should be able to:

able to interpret clinical laboratory generated results

understand the extreme ages and their associated complications and diagnosis

discuss drug monitoring in special cases of chemotheraphy

discuss disorders associated with human reproduction and infertility

describe the establishment of reference ranges, interpret and apply in routine conditions

**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

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Centrifuge, weighing balance, Chemistry analyser, Plane Photometer, Colorimeter and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Graduates who are highly skilled at providing intermediate and general medical laboratory diagnosis is in accord with BUK vision and mission to be a world class university in producing BMLS graduates who are leaders and competent and can work anywhere in the world.

**Overview**

First Professional Examination will assess the overall competence as intermediate medical laboratory scientist and as a prerequisite for final professional examination.

The course will equip students with the overall skill required at the intermediate as an evidence of the psychomotor experience acquired within the first four years of training through the demonstration of basic laboratory tests in haematology, histopathology, Chemical pathology, immunology, serology,microbiology, identification of parasites, blood group serology, urinalysis and pregnancy tests.

**Objectives**

The objectives of this course are to:

1. demonstrate basic laboratory tests in haematology
2. demonstrate basic laboratory tests in histopathology
3. demonstrate basic laboratory tests in Chemical pathology
4. demonstrate basic laboratory tests in immunology
5. demonstrate basic laboratory tests in serology
6. demonstrate basic laboratory tests in microbiology
7. demonstrate basic laboratory identification of parasites
8. demonstrate basic laboratory tests in blood group serology
9. demonstrate urinalysis and pregnancy tests

**Learning Outcomes**

At the end of the above exercise/procedure, the student should be able to:

1. carryout basic laboratory tests in haematology
2. carryout basic laboratory tests in histopathology
3. carryout basic laboratory tests in Chemical pathology
4. carryout basic laboratory tests in immunology
5. carryout basic laboratory tests in serology
6. carryout basic laboratory tests in microbiology
7. carryout basic laboratory identification of parasites
8. carryout basic laboratory tests in blood group serology
9. carry out urinalysis and pregnancy tests

**Course Contents**

This is a build-up of the practical exercises and Laboratory posting. Only students in good standing (with passes in all courses at the end of year four are eligible 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 year four are eligible for the examination).

**Minimum Academic Standards**

As contained in the NUC MASAvailability of Laboratories with a capacity of 100 students, Centrifuge, Microscopes, weighing balance, Chemistry analyser, Tissue processor, Incubator, Hot air oven, Refrigerator, Haematology analyser, Photometer, Colorimeter, Slides, Cover slip, Spreader and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Highly qualified Graduates Training of skilled with leadership potentials and competent medical laboratory science who are capable of providing excellent and evidence-based diagnostic services to clients and patients that can work anywhere in the world. This in-line with the mission of Bayero University Kano of addressing African development challenges through cutting-edge research, knowledge transfer, and the training of high-quality graduates.

**Overview**

Clinical chemistry III will provide a more specialized training to students in handling of sophisticated equipment using appropriate methods in Laboratory medicine for the diagnosis of diseases. The course entails the exposure of students to renal physiology, clearance and glomerular filtration rate as it affects humans in the assessment of his health status.

The liver anatomy and physiology in health and disease will be discussed. Significance of paraproteinaemia, Bence-Jones proteinuria, Porphyrinaemia, porphyria and porphyrinuria will be highlighted. Causes and consequences with laboratory investigation of some inborn-errors of metabolism will be discussed as well as causes and investigations of nutritional disorder with typical African and Nigerian context.

**Objectives**

The objectives of this course are to:

1. discuss kidney physiology, pathology and laboratory diagnosis

2. discuss hepato-physiology, pathology and laboratory diagnosis

3. describe different pathological proteins and their laboratory assessment

4. discuss inborn error of metabolism, types, sign and symptoms and laboratory-based assessment

5. discuss nutritional disorders and laboratory assessment judiciously

**Learning Outcomes**

At the end of the course, the students should be able to:

1. describe kidney physiology, pathology and laboratory diagnosis

2. discuss hepato-physiology, pathology and laboratory diagnosis

3. describe different pathological proteins and their laboratory assessment

4. explain the basis of inborn error of metabolism, types, sign and symptoms and laboratory

based assessment

5. explain nutritional disorders in Nigeria and their laboratory assessment

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Centrifuge, Microscopes, weighing balance, Chemistry analyser, Hot air oven, Refrigerator, Photometer, Colorimeter and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Graduates who are highly skilled and Knowledge at providing diagnosis procedure in histopathology Laboratory, which is in accord with BUK vision and mission to be a world class university in producing BMLS graduate are leaders and competent and can work anywhere in the world.

**Overview**

Medical Laboratory histopathology III will provide a more specialized training to students in handling of sophisticated equipment using appropriate methods in Medical Laboratory histopathology III for the diagnosis of diseases.

The course entails the cellular presentations in various cytological conditions, the cellular details in disordered states of various organs and systems, principle of tissue preparation for electron microscopy, electron microscopy and autoradiography techniques. The principle of automation in Histopathology laboratory and the management of Cytology and Histopathology laboratories and their results control will also be emphasized.

**Objectives**

The objectives of this course are to:

* 1. describe the cellular features in various cytological specimens.
  2. describe the cellular details in disordered states of various organs and systems.
  3. describe tissue preparation for electron microscopy.
  4. explain the principle of electron microscopy and autoradiography techniques.
  5. expose students to the use of machine in Histopathology laboratory.
  6. expose the students to managerial skills of Cytology and Histopathology laboratories and their results control.

**Learning Outcomes**

At the end of the course, students should be able to:

* + - 1. understand the cellular presentations in various cytological conditions.
      2. explain the cellular details in disordered states of various organs and systems.
      3. state the principle of tissue preparation for electron microscopy.
      4. describe electron microscopy and autoradiography techniques.
      5. state the principle of automation in Histopathology laboratory.
      6. describe the management of Cytology and Histopathology laboratories and their results control.

**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

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Centrifuge, Microscopes, weighing balance, Tissue processor, Incubator, Hot air oven, Refrigerator, Slides, Cover slip, Spreader and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate approved relevance**

Highly qualified Graduates Training of skilled with leadership potentials and competent medical laboratory science who are capable of providing excellent and evidence-based diagnostic services to clients and patients that can work anywhere in the world. This is in-line with the mission of Bayero University Kano of addressing African development challenges through cutting-edge research, knowledge transfer, and the training of high-quality graduates.

**Overview**

This will cover the scope of 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 some sophisticated equipment, DNA Finger printing for forensic analysis will be highlighted.

Other techniques such as Flourescence and radio antibody techniques, ELISA, Western blotting and Immunolectrophoresis will be discussed. Special compatibility techniques like emergency compatibility testing will be introduced. Automation in BGS covering Groupmatic and Technic on autoanalysers for antibody and antigen detection and identification will be introduced.

**Objectives**

The objectives of this course are to:

1. describe current haematological procedures;

2. discuss haematological disorders; and

3. describe the different automation in Haematology

4. describe emergency and routine laboratory assessment in blood group sciences

5. describe process of resolving dispute or confirming suspect in forensic applications

6. describe process of self-reliance in bio-reagent bio-manufacturing and entrepreneurship

**Learning Outcomes**

At the end of the course, students should be able to:

1. conduct current haematological procedures;

2. discuss haematological disorders; and

3. describe the different automation in Haematology.

4. competency in conducting emergency and routine laboratory assessment in blood group sciences

5. assist in resolving dispute or confirming suspect in forensic applications

6. self-reliance in bio-reagent bio-manufacturing and entrepreneurship

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Centrifuge, Microscopes, weighing balance, Refrigerator, Haematology analyser, Photometer, Colorimeter, Slides, Cover slip, Spreader and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Graduates who are highly skilled and knowledgeable in public Health/ field epidemiology and apply preventive measure with global best practice is in keeping with BUK vision and mission to be a world class university in hatching BMLS graduates who are leaders in laboratory diagnosis of diseases and can compute anywhere in the world.

**Overview**

This course is intended to provide theoretical and field on skills in epidemiology and provide preventive measures to most public health diseases. It will expose students to some concepts of field epidemiology and public Health management differentiate between sewage and water treatment plants, describe epidemiology and outbreak of human diseases, categorize major diseases of public health concern, state different types of laboratories and field surveillance in regard to infectious and some non-communicable diseases, describe some concepts of protozoan and helminthes infection in rural/ urban communities.

The course also aims to explain some basic training skills in Field Epidemiology. This has become very relevant in recent practice of laboratory medicine.

**Objectives**

The objectives of this course are to:

1. explain basic knowledgeof vaccine and immunization
2. describe fully sewage and water treatment plants
3. explain theepidemiology and outbreak of human diseases
4. describe major diseases of public health concern
5. explain some concepts of protozoan and helminth infection in rural/ urban communities
6. explain some basic training skills in Field Epidemiology
7. describe different types of laboratories and field surveillance in regard to infectious and some non-communicable diseases
8. describe major skills needed to assess the effects of public/environmental/ occupational agents on health

**Learning outcome**

On completion of this course, the students should be able to:

1. have basic knowledge on vaccine and immunization
2. discuss sewage and water treatment plants
3. discuss the epidemiology and outbreak of human diseases
4. discuss major diseases of public health concern
5. have basic of epidemiological study of protozoans and helminth infections in rural and urban communities
6. have basic training in Field Epidemiology
7. identify the different types of laboratories and field surveillance in regard to infectious and some non-communicable diseases
8. have understanding and skills needed to assess the effects of public/environmental/ occupational agents on health

**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, Outbreak investigations, 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 setting. 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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Centrifuge, Microscopes, weighing balance, Incubator, Hot air oven, Refrigerator, Photometer, Colorimeter, Slides, Cover slip, Spreader and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate approved relevance**

Train medical laboratory science graduates with a comprehensive knowledge of effects of pathologic processes on the individual’s functional abilities and limitations, to provide effective basic immunological knowledge for better understanding of disease to improve diagnosis services to healthcare users in the state and country at large. This is consistent with the university's vision and mission of providing leadership in research and education in Africa while also addressing African development challenges through cutting-edge research, knowledge transfer, and the training of high-quality graduates.

**Overview**

Immunological knowledge provide basis to the essential nature of disease, especially changes in body cells, tissues and organs that are caused by a disease condition.

This course also emphasizes the pathogenesis of diseases and condition, that is, the progression of each pathologic process on both its cellular level and clinical presentation whenever signs and symptoms are manifested.

**Objectives**

The objectives of this course are to:

to equip students with general and specific application of flow cytometry

to be able to evaluate paraproteinemias and gammopathies

to know the general and specific workup of a suspected immunodeficiency disease

to be able to describe the evaluation of tumor makers and monitoring of immunotherapy

student should be able to describe Methods in the evaluation of autoimmune diseases such as SLE, RA and others

can have a decipher methods and protocols in functional B and T cell assays

to understand Laboratory evaluation of allergic inflammation, allergen detection and IgE characterization

**Learning outcomes**

At the end of the course, the students should be able to:

1. describe General and specific applications of flow cytometry in laboratory immunology
2. discuss the approach to laboratory evaluation of paraproteinemias and gammopathies
3. should have decipher methods and protocols in functional B and T cell assays
4. describe Methods in the evaluation of autoimmune diseases such as SLE, RA and others
5. describe Laboratory evaluation of allergic inflammation, allergen detection and IgE characterization
6. discuss General and specific workup of a suspected immunodeficiency disease
7. describe Tumor markers evaluation and immunotherapy monitoring

**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

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Microscopes, Centrifuge, weighing balance, Incubator, flow cytometre, Biosafety Cabinet and Water bath. ELISA machine, Washer and ELISA reader.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with BUK vision and mission to be a world class university in producing BMLS graduates who are leaders and competent and can work anywhere in the world.

**Overview**

Final Professional Examination will assess the overall competence as full professional medical laboratory scientist to provide general and specialized laboratory diagnosis.

The course will equip students with the overall and specialized skill required as evidence of specialized psychomotor experience acquired within the first four years of training through the demonstration of basic laboratory tests in Haematology, Histopathology, Chemical Pathology, Immunology, Serology, Microbiology, identification of parasites and Blood Group Serology.

**Objectives**

The objectives of this course are to:

1. demonstrate specialized laboratory tests in haematology
2. demonstrate specialized laboratory tests in histopathology
3. demonstrate specialized laboratory tests in Chemical pathology
4. demonstrate specialized laboratory tests in immunology
5. demonstrate specialized laboratory tests in microbiology
6. demonstrate specialized laboratory identification of parasites
7. demonstrate specialized laboratory tests in blood group serology

**Learning Outcomes**

At the end of the above exercise/procedure, the student should be able to:

1. carry out specialized laboratory tests in haematology
2. carry out specialized laboratory tests in histopathology
3. carry out specialized laboratory tests in Chemical pathology
4. carry out specialized laboratory tests in immunology
5. carry out specialized laboratory tests in microbiology
6. carry out specialized laboratory identification of parasites
7. carry out specialized laboratory tests in blood group serology

**Course content**

This is a build-up of 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 year five are eligible for the examination). Each student carries out 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.

**Minimum Academic Standards**

As contained in the NUC MAS Availability of Laboratories with a capacity of 100 students, Centrifuge, Microscopes, weighing balance, Chemistry analyser, Tissue processor, Incubator, Hot air oven, Refrigerator, Haematology analyser, Photometer, Colorimeter, Slides, Cover slip, Spreader and Water bath.

**Bayero University, Kano**

**Faculty of Allied Health Science**

**Department of Medical Laboratory Science**

**B.MLS. Medical Laboratory Science**

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

**Senate Approved Relevance**

Graduates who are highly skilled at providing specialized diagnosis in Medical Microbiology and Parasitology is in accord with BUK vision and mission to be a world class university in producing BMLS graduates who are leaders and competent and can work anywhere in the world.

**Overview**

Medical Laboratory Microbiology III will provide a more specialized training to students to handle sophisticated equipment using appropriate methods in Medical Laboratory microbiology and Parasitology for the diagnosis of diseases and research. The pre-requisite for this course must have been completed in the previous level.

The course entails basic concepts of biochemical basis for identification of bacteria of medical importance, systemic infections, basic concepts of serological basis for identification of bacteria of medical importance, basic skills for the control of hospital infections and identification of microbes

**Objectives**

The objectives of this course are to:

1. explain how to collect, transport and preserve clinical specimen for viral study
2. describe how to propagate viruses and culture identification of different types of viruses
3. teach different techniques for viral laboratory isolation
4. describe pathogenesis, epidemiology, immunology and management of clinically important viruses
5. explain the biology of arthropods vectors of medical importance
6. describe the proces of culture of parasites and preservation of insects.

**Learning outcome**

At the end of the course, the students should be able to:

* + - 1. know how to collect, transport and preserve clinical specimen for viral study
      2. know how to propagate viruses and culture identification of different types of viruses
      3. learn different techniques for viral laboratory isolation
      4. describe pathogenesis, epidemiology, immunology and management of clinically important viruses
      5. explain the biology of arthropods vectors of medical importance
      6. know the procces of culture of parasites and preservation of insects

**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.

**Minimum Academic Standards**

As contained in the NUC MAS. Availability of Laboratories with a capacity of 100 students, Centrifuge, Microscopes, weighing balance, Incubator, Hot air oven, Refrigerator, Slides, Cover slip, Spreader and Water bath. ELISA machine, Washer and ELISA reader.