NIGER DELTA UNIVERSITY

WILBERFORCE ISLAND, BAYELSA STATE

B. MLS - Bachelor of Medical Laboratory Science

Faculty of Allied Health Sciences

Student Handbook

2023-2028

NIGER DELTA UNIVERSITY WILBERFORCE ISLAND BAYELSA STATE
FACULTY OF ALLIED HEALTH SCIENCES
DEPARTMENT OF MEDICAL LABORATORY SCIENCE (B.MLS)

Mission Statement of the University

To strive to maintain an international reputation for high quality scholarship, research, and academic excellence for the promotion of the socio- cultural and economic well being of mankind.

Vision Statement of the university

To be a centre of excellence defined by well articulated programme that will produced creative and innovative minds .

Motto

Creativity, Excellence, Service

Principal officers of the University

1. Professor Samuel Godwin Edoumiekumo –Vice Chancellor
   PhD Econometrics (UNN), PhD Economics (UNIPORT)

2. Professor Tonbara kingdom – Deputy Vice Chancellor Academics
   PhD Economics- (UNIPORT)

3. Professor Jonah Akekere – Deputy Vice Chancellor Administration
   PhD Fishries (UNIPORT)

4. Dr Biokuromoye Fyneman –University Librarian
   PhD Library and information Science PhD (IMSU)

5. Mr Benjamin Joffa - Registra -
   B.A (UNIPORT) , PGD sociology (NDU)

S/NO	NAME	QUALIFICATION	SPECIALIZATION	DESIGNATION
1.	Dr. OBOMA Y.I	PhD- UNIZIK, Msc- IUO BMLS – UNICAL , FMLSCN FWAPCMLS– NIGERIA **RF-2247**	Cytopathology	Senior Lecturer / Ag HOD
2	Professor, TATFENG Y. M	PhD- Ekpoma , MMLS-Ekpoma PGD-Ekpoma , FMLSCN FWAPCMLS– Nigeria **RF- 1149**	Immunology/ Microbiology	Professor
3	Professor, BUSERI, F. I	PhD- RSUST, Msc- Ibadan BSc – RSUST, FMLSCN FWAPCMLS– Nigeria	Hematology	Professor
4	Professor MIE-EBI M. W	BSC – RSUST, MSC – Ibadan PhD-2005 Essex , AMLSCN	Clinical Chemistry	Professor
5	Professor EZEIRUAKU, C.F	B.Sc-RSUST, M.Sc- Port-Harcourt Ph.D- Unical, AMLSN FWAPCMLS –Nigeria **RA-2698**	Clinical Chemistry	Professor
6	Dr. GBORIENEMI S.G	B.Sc- RSUST, MSc. - Port Harcourt PhD Port Harcourt , AMLSCN **RA-2249**	Chemical pathology	Reader
7	Dr.(Mrs) OLUWAYEMISI A. O	B.Sc-Ibadan, MSc- Port-Harcourt PhD- Port-Harcourt, AMLSCN FWAPCMLS –Nigeria **RA 8694**	Medical Microbiology/Mycology	Reader
8	Dr. ALADE, O. T	BMLS- Ekpoma, M.Sc- , PhD NDU , AMLSCN **RA- 9652**	Bacteriology/molecular biology	Senior lecturer
9	Dr. ONYIJE F. M	BSc-Port Harcourt, MSc-PortHarcourt. PhD Nnewi, AMLSCN-	Histopathology	Lecturer 1

10	Dr. LAWANI-Luwaji, E. U	BMLS- RSUST, M.Sc- RSUST PhD –ARU, Cambridge , AFHEA **RA- 7077**	Medical Microbiology	Lecturer 1
11	Dr EGORO, T. E	AMLSCN-, PGD- RSUST, PhD NDU, MSc-2015 **RA-3041**	Clinical Chemistry	Lecturer 1
12	**MR ILEGBEDION, IKHIDE**	AMLSCN, PGD- Ibadan M.Sc- IUO **RA. 2786**	Histopathology	Lecturer 1
13	MR ARIKEPKAR, I	BMLS- RSUST, MSc- RSUST, AMLSCN **RA-9237**	Medical Microbiology	Lecturer 1
14	MR. ERIC U. E	BMLS- Ekpoma, MSC- IUO	Molecular Pathology	Lecturer 1
15	MR. BEREDUGO S	BMLS- NDU , MSc –NDU **RA-24,328**	Histopathology	Assistant lecturer
16	MR. ONITSHA E .N	BMLS-NDU , MSc –NDU **RA, 24301**	Chemical Pathology	Assistant lecturer
17	Professor, WACHUKWU C. K	B.Sc –RSUST, AMLSCN, M.Phil- RSUST, Ph.D - RSUST	Medical Microbiology	Professor / Adjunct
18	Professor OKUNGBOWA, M. A.	FMLSCN, MSc- BENIN Ph.D- Benin	Medical Microbiology/ Parasitology	Professor/ Adjunct
19	MR. SOLOMON, A. E	B.Sc- RSUST, M.Sc- UNIMAID AMLSCN	Chemical Pathology	Lecturer 11/ Adjunct
20	MR. OBELE, K.	M.Sc-2013 RSUST FMLSCN-1998	Chemical Pathology	Lecturer 11/ Adjunct

NON –ACADEMIC STAFF

	Name			

S/N		Rank/Designation Date of first Appointment	Qualifications, Dates Obtained Membership of Professional Association	Duties Performed/Courses Taught
1	MRS. OGBEDE, GLORIA TOKONI	DEPUTY DIRECTOR	B.MLS;-RUST, M. Sc –RSUST AMLSCN , **RA-7424**	Head of Laboratory, Conduct & supervise practical classes (**Chemical pathology**)
2	MRS. LEGHEMO, GRACE BODISERE.	CHIEF MLS	BMLS – RSUST , PGD MSC – UNIBEN . AMLSCN , **RA-8409**	Supervise Scientist, Co-ordination of Practical (Hematology /Blood transfusion science

Overview

The Medical Laboratory Science (MLS) programme has over the years transited from a 4-year Bachelor of Science (B.Sc.) to a 5-year Bachelor of Medical Laboratory Science (B.MLS) honors degree offered in many public and private Universities in Nigeria. This was necessitated by some inadequacies observed in the training curriculum and the need to build capacity at the undergraduate level to cater for advances in modern diagnostics and disease dynamics.

Philosophy

The broad philosophy of training in medical laboratory sciences are to Provide sound academic and professional background for the production of Medical Laboratory Scientists who would be capable of working anywhere in Nigeria. It is also aimed at producing Medical Laboratory Scientists who would satisfy internationally recognizable standards and who could undertake further training towards specialization and Medical Laboratory Scientists with sufficient management ability to play a leadership role and entrepreneurship in employing others, establishing self, and also in training and general practice of laboratory sciences.

Objectives

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

1. provide sound academic and professional background for the production of Medical Laboratory Scientists who would be capable of working anywhere in Nigeria;
2. instill in students a sense of enthusiasm for the profession; an appreciation of its application in different contexts (in areas such as general medicine, food and beverages, pharmaceutical industries, utility departments such as water corporations; research institutions and many others);
3. involve the students in an intellectually stimulating and satisfying experience of learning, studying and research;
4. provide students with a broad and balanced foundation of medical laboratory knowledge and practical skills; performing effectively in clinical diagnostic services, academics and quality

assurance; and function independently or in collaboration with other members of the health team in the care of individuals and groups at all levels of health care;
5. develop in students, the ability to apply their medical laboratory knowledge and skills to the solution of theoretical and practical problems in laboratory medicine;
6. develop in students through an education in medical laboratory sciences, a range of transferable skills of value in medical and non-medical employment;
7. provide students with a knowledge and skills base from which they can proceed to further studies in specialized areas involving medical sciences;
8. To generate in students, an appreciation of the importance of medical laboratory sciences in an industrial, economic, environmental, health and social context;
9. generate students with the ability to produce biological and diagnostic reagents as well as being able to fabricate and maintain laboratory equipment; and
10. empower graduates of Medical Laboratory Sciences with skills that will enable them engage in income yielding ventures.

Unique Features of the Programme

1. The BMLS curriculum aims at training a Medical Laboratory Scientist with an area of specialization in the subject area thus graduating with quasi specialization at the first degree level.
2. Final year BMLS students specializing in the 6 core departmental areas of Medical Laboratory Science take different parallel courses.

Employability Skills

1. Skills in safe handling of laboratory materials, taking into account specific and potential hazards
2. Skills required for the conduct of standard laboratory procedures involved in analytical and diagnostic work
3. Competence in planning, design and execution of practical investigation from the problem recognition stage through to the evaluation and appraisal of results and findings - i.e. also including the ability to select appropriate techniques and procedures
4. Skills to operate standard laboratory instrumentation such as that used for laboratory investigations 5. Ability to interpret data derived from laboratory investigations in terms of their significance
6. Ability to conduct risk assessments concerning some laboratory reagents and procedures

21st Century Skills

1. Collaboration and team work
2. Creativity and imagination
3. Critical thinking
4. Problem solving
5. Flexibility and adaptability
6. Information Literacy
7. Leadership

8. Civic literacy and citizenship
9. Social responsibility
10. Technology literacy
11. Initiative

Admission and Graduation Requirements

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

Admission Requirements

The B.MLS degree programme shall run for 5 years for Unified Tertiary Matriculation Examination entry candidates and 4 years for Direct Entry candidates. Five-Year Degree Programme: In addition to appropriate UTME scores, five Senior Secondary Certificate (SSC) (or its equivalent) credit passes including Mathematics, Physics, Chemistry, Biology and English Language in not more than two sittings Direct Entry (DE) Candidates of Allied Health Science disciplines with BSc in Biochemistry, Anatomy, Physiology, Microbiology, Zoology, and candidates with GCE 'A' level with minimum of credit passes in Biology, Chemistry and Physics in addition to the above Senior Secondary Certificate (SSC) credit passes, may enter the Programme at 200 Level. Holders of Medical Laboratory Technician (MLT) certificate of the Medical Laboratory Science Council of Nigeria who have at least five Senior Secondary Certificate credit passes in Physics, Chemistry, Biology, Mathematics and English Language (WAEC, NECO and NABTEB) at no more than 2 sittings are eligible for direct entry at 200 level. The medical laboratory technician already has an appropriate academic knowledge and skill in Medical Laboratory Science. The B.MLS degree programme shall run for 5 years for UTME entry candidates and 4 years for Direct Entry candidates. The pass mark for core courses is 50%. The degree is a unclassified degree. Global Course Structure Preamble Courses shall be provided leading to the degree of Bachelor of Medical Laboratory Sciences which may be awarded to students who have successfully fulfilled all academic requirements. The training shall be a combination of teacher-directed, tutor-guided, self-learning and problem-based methods

COURSE CONTENT AND LEARNING OUTCOMES

100 Level

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

CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM 108	General Chemistry Practical II	1	C	-	45
COS 101	Introduction to Computing Science	3	C	30	45
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics I I 2	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
NDU-MLS -102	Medical Laboratory Bio-risk Management	2	C	15	45
NDU-MLS -106	History of Medical Laboratory Science	2	C	15	45
NDU-MLS - 111	Introduction to Biology of Diseases	2	C	15	45
	Total	**31**			

200 Level

Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	30	-
ANA 203	General and Systemic Embryology	2	C	30	-
BCH 201	General Biochemistry I	2	C	30	-
BCH 203	General Biochemistry Practical 1	1	C	-	45
ANA202	Histology of Basic Tissues	2	C	15	45
MCB 201	Introduction to General Microbiology	2	C	30	-
MLS 201	Introduction to Medical Laboratory Science	2	C	15	45
PIO 201	Introductory Physiology and Blood	2	C	30	-
PIO 203 -	Physiology of Excitable Tissues	2	C	30	-
ANA 201	Anatomy of Upper and Lower Limb	2	C	15	45
BCH 202	General Biochemistry II	2	C	30	-
PIO 214	Introduction to Cardiovascular and Respiratory Physiology	2	C	15	-
PIO 216	Gastrointestinal Physiology	2	C	15	45
STA 201	Biostatistics	2	C	30	-
Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
NDU-MLS 203	Production of Biologicals, Chemicals and Diagnostic Reagents	3	C	15	60

NDU-MLS 205	Principles of diseases	3	C	15	60
NDU-MLS 207	General Pathology I	3	C	15	60
	TOTAL	**38**			

300 Level

Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
MLS 302	Basic Hematology	2	C	15	45
MLS 303	Basic Microbiology	2	C	15	45
MLS 304	Basic Histopathology	2	C	15	45
MLS 301	Basic Clinical Chemistry	2	C	15	45
MLS 307	Practical Exercise I	2	C	15	45
MLS 305	Basic Immunology	2	C	15	45
MLS 306	Laboratory Posting I	2	C	15	45
MLS 308	Fundamentals of blood group serology	2	C	15	45
MLS 309	Basic Medical Parasitology and entomology	2	C	15	45
MLS 310	Biomedical Engineering	2	C	15	45
PHA 301	Basic Pharmacology &Toxicology	2	C	15	45
BCH 304	Chemistry and Metabolism of Amino acids	2	C	30	-
Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
NDU- MLS 312	Molecular Biology and Microbial Genetics	2	C	15	45
NDU–MLS 315	General Pathology II	2	C	15	45
NDU-MLS 317	Toxicology	2	C	15	45
NDU-MLS 341	Basic Cytology	2	C	15	45
NDU-MLS 332	Introduction to public health	2	C	15	45
NDU-MLS 362	Introduction to Coagulation Studies	2	C	15	45
	Total	**40**			

400 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
MLS 402	Medical Laboratory Haematology	2	C	15	45
MLS 403	Medical Laboratory Histopathology I	2	C	15	45
MLS 404	Medical Laboratory Microbiology I	2	C	15	45
MLS 405	Laboratory Instrumentation & Techniques	2	C	15	45
MLS 407	Practical Exercise II	2	C	15	45
MLS 410	Clinical Chemistry I	2	C	15	45
MLS 408	Laboratory Posting II	2	C	15	45
MLS 411	Blood Group Serology	2	C	15	45
MLS 412	Professional Ethics in Med Lab Science	2	C	15	45
MLS 406	Research Methodology	2	C	15	45
MLS 401	Laboratory Management and Function, practice	2	C	15	45
Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
NDU-MLS 423	Medical Laboratory Supply Chain Management	2	C	15	45
NDU-MLS 462	Molecular Diagnostics and Bioinformatics	2	C	15	45
NDU-MLS 441	Immunopathology	2	C	15	45
NDU-MLS 451	Tissue Slide Reading and Reporting	2	C	15	45
NDU-MLS 491	First Professional Examination	3	C	-	60
	Total	**33**			

500 LEVEL –(HISTOPATHOLOGY /CYTOLOGY)

Course Code	Course Title	Unit(s)	Status	LH	PH
MLS 503	Practical Exercises III	2	C	-	90
MLS 505	Seminar	2	C	-	-
MLS 512	Medical Laboratory Histopathology II	2	C	15	45
MLS 502	Laboratory Posting III	2	C	15	45
MLS 504	Research Project	6	C	-	270
Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
NDU-MLS 551	Diagnostic techniques in histopathology	2	C	15	45

NDU-MLS 552	Diagnostic cytology	2	C	15	45
NDU-MLS 553	Cytogenetics	2	C	15	45
NDU-MLS 554	Forensic Science	2	C	15	45
NDU-MLS 555	Systemic pathology / Organ histology	2	C	15	45
NDU-MLS 556	Final Professional examination	3	C	-	60
	TOTAL	**26**			

500 LEVEL (HAEMATOLOGY AND BLOOD TRANSFUSION SCIENCE)

Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
MLS 503	Practical Exercises III	2	C	-	90
MLS 505	Seminar	2	C	-	-
MLS 510	Medical Laboratory Haematology II	2	C	15	45
MLS 502	Laboratory Posting III	2	C	15	45
MLS 504	Research Project	6	C	-	270
Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
NDU-MLS 561	Immunohaematology	2	C	15	45
NDU-MLS562	Blood group serology II	2	C	15	45
NDU-MLS 563	Haemostasis	2	C	15	45
NDU-MLS 564	Cytogenetics	2	C	15	45
NDU-MLS 565	Blood group serology III	2	C	15	45
NDU-MLS 566	Final professional examination	3	C	-	60
	TOTAL	26			

500 LEVEL (MEDICAL MICROBIOLOGY)

Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
MLS 503	Practical Exercises III	2	C	-	90
MLS 505	Seminar	2	C	-	-
MLS 514	Medical Laboratory Microbiology II	2	C	15	45
MLS 502	Laboratory Posting III	2	C	15	45
MLS 504	Research Project	6	C	-	270
Course Code	**Course Title**	**Unit(s)**	**Status**	**LH**	**PH**
NDU-MLS 571	Molecular diagnostic & Bioinformatics	2	C	15	45

NDU-MLS 572	Diagnostic immunology	2	C	15	45
NDU-MLS 573	Pathogenic Microbiology	2	C	15	45
NDU-MLS 574	Therapeutic and antibiotics agents	2	C	15	45
NDU-MLS 575	Public health microbiology	2	C	15	45
NDU-MLS 576	Final professional examination	3	C	-	60
	TOTAL	26			

500 LEVEL (CHEMICAL PATHOLOGY)

Course Code	Course Title	Unit(s)	Status	LH	PH
MLS 503	Practical Exercises III	2	C	-	90
MLS 505	Seminar	2	C	-	-
MLS 508	Clinical Chemistry II	2	C	15	45
MLS 502	Laboratory Posting III	2	C	15	45
MLS 504	Research Project	6	C	-	270
NDU-MLS 581	Clinical toxicology	2	C	15	45
NDU-MLS 582	Clinical Enzymology/Endocrinology	2	C	15	45
NDU-MLS 583	Inborn error of metabolism / tumor markers	2	C	15	45
NDU-MLS 584	Renal-hepatic function /Free radicals	2	C	15	45
NDU-MLS 585	Forensic Science	2	C	15	45
NDU-MLS 586	Final professional examination	3	C	-	60
	TOTAL	**26**			

100 Level

Course Contents and Learning Outcomes

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

Learning Outcomes

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

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

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

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

Learning Outcomes

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

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards Nation building;
6. analyse the role of the Judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems

Course Contents

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

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

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

Learning Outcomes

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

1. explain cell's structure and organisations;
2. summarise functions of cellular organelle;
3. characterise living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents

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

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

Learning Outcomes

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

1. List the characteristics, methods of identification and classification of Viruses, bacteria and fungi;
2. state the unique characteristics of plant and animal kingdoms;
3. describe ecological adaptations in the plant and animal kingdoms;
4. explain nutrition, respiration, excretion and reproduction in plants and animals; and
5. describe growth and development in plants and animals.

Course Contents

Basic characteristics, identification and classification of viruses, bacteria and fungi. A generalised survey of the plant and animal kingdoms based mainly on the study of similarities and differences

in the external features. Ecological adaptations. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth and development.

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

Learning Outcomes

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

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

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

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

Learning Outcomes

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

1. describe the anatomy of flowering plants;
2. differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares;
4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

Course Contents

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

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

Learning Outcomes

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

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. rationalise the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems.
6. draw shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using Le Chatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence Forces. Structure of solids. Chemical equations and stoichiometry. Chemical bonding and intermolecular forces. Kinetic theory of matter. Elementary thermochemistry. Rates of reaction. Equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to
electrochemistry. Radioactivity.

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

Learning Outcomes

At the end of this course, the students should be able to:
1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reactions;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of Transition metals

Course Contents

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

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

Learning Outcomes

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

1. state the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. state the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

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

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

Learning Outcomes

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

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. perform solubility tests on known and unknown organic compounds;
6. conduct elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents

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

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

Learning Outcomes

At the end of the course, students should be able to:
1. explain 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 Contents

Brief history of computing. Description of the basic components of a computer/computing device. Input/Output devices and peripherals. Hardware, software and human ware. Diverse and growing computer/digital applications. Information processing and its roles in society. The Internet, its applications and its impact on the world today. The different areas/programs of the computing discipline. The job 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 resources.

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

Learning Outcomes

At the end of the course, student should be able to;
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;

5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity

Course Contents

Space and time. Units and dimension, Vectors and Scalars. Differentiation of vectors: displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion.Conservation principles in physics. Conservative forces. Conservation of linear momentum. Kinetic energy and work. Potential energy. System of particles. Centre of mass. Rotational motion:Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia. gyroscopes and precession. Gravitation: Newton's Law of Gravitation. Kepler's Laws of Planetary Motion. Gravitational Potential Energy. Escape velocity. Satellites motion and orbits.

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

Learning Outcomes

At the end of this course, the student should be able to:
1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law; 5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.

Course Contents

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

step-down transformers: Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

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

Learning Outcomes

At the end of the course, the student should be able to;

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;

4. plot and analyse graphs; and 5. draw conclusions from numerical and graphical analysis of data.

Course Contents

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

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

Learning Outcomes

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

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;

4. plot and analyse graphs; 5. draw conclusions from numerical and graphical analysis of data; and

6. prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements. The treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

NDU-MLS 102 - Medical Laboratory Bio-risk Management (2 Units C: LH 15; PH -30)

Senate approved relevance

Training of student and graduates who are highly skilled and knowledgeable in identifying risks and applying preventive measure with global acceptance is our priority. NDU vision and mission is 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 is to enable student 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 and
8. describe biosecurity procedures.

Learning Outcomes

At the end of this course, the students are able to:

1. explain biorisk, biosafety and biosecurity ;
2. describe the management of 5 medical laboratory bio-risks ;
3. list 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 and
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.Measuringbio-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.

NDU- MLS 106 - History of Medical Laboratory Science (2 Units C: LH 15; PH 45)

Senate approved relevance

Training and graduating students who are highly skilled and knowledgeable in the evolution of medical laboratory science profession in Nigeria is in line with NDU vision and mission. NDU vision and mission is 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.

It 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.

Objectives

The objectives of this course is enable students 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.state the rules and regulations governing training of medical laboratory scientists ;
5.explain the procedure involved in programme approval and accreditation ;
6.state the requirements expected of a Medical Laboratory Scientist to be a member and chairman of MLSCN board ;
7.describe indexing, induction and internship procedures and
8.describe the challenges and Prospects of Medical Laboratory Science Education in Nigeria.

Learning Outcomes

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

1. explain the evolution of medical laboratory science practice ;

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

Course Contents

Global and National Evolution of Medical Laboratory Science practice. 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 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.

NDU-MLS111- Introduction to Biology of Diseases (2 Units C: LH 15; PH 45)

Senate approved relevance

Training and graduating students who are highly skilled and knowledgeable in Biology of Diseases for application in laboratory procedures and in the quality control and disease surveillance is in line with NDU vision and mission. NDU vision and mission is 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.

Objective

The objectives of this course is enable students 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 and

6.compare and contrast infectious and non-infectious diseases.

Learning Outcomes

At the end of this course, the students are able to:

1. explain the basis of cell in life and define disease ;

2. state 5 primary causes in each case of 10 body system disorders ;

3. state the 4 cardinal signs of inflammation ;

4. explain the immunity and state 10 immune disorders ;

5. describe 10 agents of infectious and non-infectious diseases and

6. list 5 difference between infectious and non-infectious diseases .

Course Contents

Basic concepts of disease. Congenital and acquired diseases. Disturbances of normal homeostatic mechanisms. Primary causes of cell disorders. Effects of environmental toxins. Malnutrition.Immunity and Immune disorders. Metabolic disorders(elementary). .Accumulation of metabolites; intracellular and extracellular accumulations. Trauma. Toxins. Pathogens and pathogrenicity. 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).

200 Level

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

Learning Outcomes

A student who has successfully gone through this course should be able to:

1. enumerate the basic features of philosophy as an academic discipline;

2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;

3. describe the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge; and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

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

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

Learning Outcomes

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

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents

Concept of Entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate Entrepreneurship). Theories, Rationale and relevance of Entrepreneurship (Schumpeterian and other perspectives, Risk-Taking, Necessity and opportunity-based entrepreneurship and Creative destruction). Characteristics of Entrepreneurs (Opportunity seeker, Risk taker, Natural and Nurtured, Problem solver and change agent, Innovator and creative thinker). Entrepreneurial thinking (Critical thinking, Reflective thinking, and Creative thinking). Innovation (Concept of innovation,

Dimensions of innovation, Change and innovation, Knowledge and innovation). Enterprise formation, partnership and networking (Basics of Business Plan, Forms of business ownership, Business registration and Forming alliances and join ventures). Contemporary Entrepreneurship Issues (Knowledge, Skills and Technology, Intellectual property, Virtual office, Networking). Entrepreneurship in Nigeria (Biography of inspirational Entrepreneurs, Youth and women entrepreneurship, Entrepreneurship support institutions, Youth enterprise networks and Environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce

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

Learning Outcomes

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

1. explain the basic concepts and scope of microbiology;
2. know the scope of microbiology layout of microbiology laboratory equipment and reagents in microbiology; and
3. explain the theory behind basic protocols in a microbiology laboratory.

Course Contents

The Kingdom Protista Organisation differences in eucaryotic cells classification and nomenclature of micro-organisms. Bacterial cell form, structure nutrition reproduction and metabolism. Bacterial genetics. A typical prokaryotic cell Viruses. Encaryotic Micro-organism-fungi microbial control, microbes in food, water and environment. Bacterial infection and virulence. Phagocytosis. Introduction to pathogenic microbiology. Laboratory animals, types breeding and uses

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

Learning Outcomes

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

1. explain the structure of different macromolecules in biological system;
2. identify types of chemical reactions involving these macromolecules;
3. explain the various methods of isolation of these macromolecules;
4. estimate the effects of acids and alkalis on the macromolecules;
5. describe purification of macromolecules; and
6. discuss quantification the various macromolecules.

Course Contents

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

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

Learning Outcomes

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

1. explain the structure of the cell including its components;
2. discuss the interrelationship between different organelles of the cell;
3. recognise the differences between plant and animal cells;
4. isolate the various organelles of both plant and animal cells; and
5. discuss the influence of hydrogen ion concentration on cellular function.

Course Contents

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

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

Learning Outcomes

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

1. describe the laboratory experiments designed to reflect the topics covered;

and

2. explain the laboratory procedures used in the study of various biochemical processes.

Course Contents

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

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

Learning Outcomes

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

1. name common current histological techniques;
2. enumerate the principles, techniques and functional applications of Histology;

3. define and explain the cell in relation to its environment, surface components and content;
4. explain the interrelationship and interdependency between cell structures and functions; and
5. identify the microscopic appearance of tissues such as muscle, cartilage, etc in relation to their staining.

Course Contents

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

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

Learning Outcomes At the end of this course, students should be able to:
1. explain how the embryo is form from the zygote;
2. discuss the role of cleavage and gastrulation in animal development;
3. demonstrate understanding of embryology and significance of prenatal diagnostic methods;
4. describe structural features of primordia in tissue and organs at different developmental stages;
5. define risk periods in histo- and organogenesis; and 6. analyse the most often observed developmental anomalies.

Course Contents

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

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

Learning Outcomes

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

1. define fundamental anatomical terminology and discuss the anatomical position;
2. describe the anatomy of the musculoskeletal system, including the axial skeleton; appendicular skeleton, appendicular and axial muscles, and arthrology;
3. describe the general features of the bones of the upper and lower limbs;
4. identify the major muscles of the upper and lower limbs;
5. explain the types and structure of the joints of the upper and lower limbs;
6. correlate between the attachment of the muscles and their functions on the different joints;
7. identify the major nerves of the upper and lower limbs;
8. describe the functional components of each of the major nerves and its distribution;
9. identify and describe the course of the major superficial veins of the upper and lower limbs; and 10. name the major arteries of the upper and lower limbs.

Course Contents

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

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

Learning Outcomes

At the end of this course, students should be able to:
1. describe the composition of a cell membrane;
2. explain how a potential difference across a membrane will influence the distribution of a cation and an anion;
3. describe how transport rates of certain molecules and ions are accelerated by specific membrane transport proteins;
4. distinguish between active (primary and secondary) transport, facilitated diffusion, and passive diffusion based on energy source and carrier protein involvement;
5. identify the mechanisms and role of selective transporters for amino acids, neurotransmitters, nutrients, etc.;
6. explain the general concepts of homeostasis and the principles of positive and negative feedback in physiological systems;
7. identify the site of erythropoietin production, the stimulus for its release, and the target tissue for erythropoietin action;

8. discuss the normal balance of red blood cell synthesis and destruction, including how imbalances in each lead to anemia or polycythemia;
9. list and differentiate the various types of leukocytes;
10. describe the role of thrombocytes in haemostasis; and
11. list clotting factors and the discuss the mechanism of anti-coagulants.

Course Contents

Introduction and history of physiology. Structure and functions of cell membranes. Transport process. Special transport mechanism in amphibian bladder, kidney, gall bladder, intestine, astrocytes and exocrine glands. Biophysical principles. Homeostasis and control systems including temperature regulation. Biological rhythms. Composition and functions of blood. Haemopoiesis. WBC and differential count. Plasma proteins Coagulation, fibrinolysis and platelet functions. Blood groups –ABO system – Rh system. Blood transfusion – indication for collection and storage of blood, hazards of blood transfusions. Reticulo- endothelial system. Imunity and immodeficiency disease and HIV.

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

Learning Outcomes

At the end of this course, students should be able to:
1. list the steps in excitation-contraction coupling in skeletal muscle;
2. describe the structure of the neuromuscular junction;
3. list some intracellular factors that can cause muscle fatigue;
4. describe the distinguishing characteristics of multi-unit and unitary smooth muscles;
5. explain the steps in the excitation-contraction coupling mechanism in cardiac muscle and compare with skeletal muscle including different mechanisms for sarcoplasmic reticulum calcium release;
6. explain how the resting membrane potential is generated
7. state the Nernst equation, and indicate how this equation accounts for both the chemical and electrical driving forces that act on an ion;
8. discuss the mechanisms by which an action potential is propagated along both nonmyelinated and myelinated axons;
9. describe the principle of the voltage clamp and how it is used to identify the ionic selectivity of channels; and
10. discuss the disorders that can occur at the neuromuscular junction.

Course Contents

Structure and classification of muscles, excitation and contraction theories and principles involved in muscles contraction, resting membrane and action potentials. Generation of impulses in excitable tissues. Nerve and neuromuscular transmissions. Simple reflex and spinal reflexes.

Spinal cord ascending, descending pathways. Receptors. Thalamus-sensory motor cortex. Control of posture and movement. The reticular activating system, sleep, neural centers regulating Visceral functions. Neurophysiological basis of instinctive behaviour, conditioned reflexes learning, and temperature regulation. Sympathetic and parasympathetic pathways. Role in the various system especially cardiovascular, respiratory and gastro intestinal.

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

Learning Outcomes

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

1. state Starling's law of the heart and describe the application of the law in keeping the output of the left and right ventricles equal;
2. describe how ionic currents contribute to the four phases of the cardiac action potential;
3. explain the ionic mechanism of pacemaker automaticity and rhythmicity, and identify cardiac cells that have pacemaker potential and their spontaneous rate;
4. identify neural and humoral factors that influence their rate;
5. describe the various phases of ventricular systole and ventricular diastole;
6. describe the timing and causes of the four heart sounds;
7. explain why the ECG tracing looks different in each of the 12 leads;
8. explain the principles underlying cardiac output measurements using the Fick principle, dye dilution, and thermodilution methods;
9. list the factors that shift laminar flow to turbulent flow;
10. describe the relationship between velocity, viscosity, and audible events, such as murmurs and bruits;
11. describe how arterial systolic, diastolic, mean, and pulse pressure are affected by changes in a) stroke volume, b) heart rate, c) arterial compliance, and d) total peripheral resistance;
12. define the Starling equation and discuss how each component influences fluid movement across the capillary wall;
13. list the anatomical components of the baroreceptor reflex;
14. explain three positive feedback mechanisms activated during severe hemorrhage that may lead to circulatory collapse and death;
15. define compliance and identify two common clinical conditions in which lung compliance is higher or lower than normal;
16. list the factors that determine total lung capacity, functional residual capacity, and residual volume;
17. define surface tension and describe how it applies to lung mechanics, including the effects of alveolar size and the role of surfactants;
18. explain how the shape of the oxyhemoglobin dissociation curve influences the uptake and delivery of oxygen;
19. list the forms in which carbon dioxide is carried in the blood; and

20. identify the regions in the central nervous system that play important roles in the generation and control of normal respiration.

Course Contents

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

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

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

1. compare and contrast the regulation of gut function by nerves, hormones, and paracrine regulators; 2. identify the cell type and anatomical location of the endocrine cells secreting major GI hormones, such as gastrin, secretin, cholecystokinin (CCK), GLP-1, GLP-2, leptin, and motilin;
3. list the physiological functions of the components of saliva;
4. describe the role of HCl in the gastric digestion of carbohydrates and protein, and how pepsinogen is activated;
5. list the mechanisms contributing to gastric mucosal defense and how they can be compromised by drugs or pathogens;
6. list the stimuli that release secretin and CCK and explain the route by which these regulatory peptides stimulate the pancreas;
7. describe the cellular mechanisms for the hepatic uptake, conjugation, and secretion of bile salts and bilirubin;
8. describe the sequential digestion of ingested starch by enzymes of the salivary glands, pancreas, and the intestinal apical membrane;
9. describe the mechanisms and molecules mediating the solubilization and digestion of lipids in the small intestine; and
10. describe the disorders of motility that can lead to gastroparesis, achalasia, diarrhea, constipation, megacolon and irritable bowel syndrome.

Course Contents

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

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

Learning Outcomes

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

1. define safety awareness for Medical Laboratory Personnel;
2. describe steps used as precautionary measures;
3. select the correct means of disposal of waste generated in the Medical Laboratories;
4. list the types of samples used in the clinical laboratories;
5. identify the preanalytical, pre-collection, collection and post collection variables that can adversely affect laboratory results;
6. list the proper drawing order for collection tubes; and
7. describe the general steps for processing samples.

Course Contents

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

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

Learning Outcomes

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

1. explain the scope for statistical methods in health science;
2. define the measures of location partition and dispersion;
3. explain the elements of probability, probability distribution;
4. describe the test for hypotheses concerning population means proportions and variances;
5. compute for regression and correlation as well as conduct some non-parametric tests reference to contingency table analysis; and 6. explain the elements of design of experiments and analysis of variance.

Course Contents

Aims, characteristics and application of biostatistics in clinical and preventive medicine. Statistical data in bio-medical science-samples, population, variables, frequency distribution, vital and descriptive statistics, measurement of central tendencies-mean, median, mode, dispersion and

presentation of data probability distribution, Hypothetical tests of statistical significance. Analysis of variance. Regression and correlation. Experimental designs and clinical trials.

NDU -MLS -203 Production of Biologicals, Chemicals and Diagnostic Reagents (2 Units C: LH 15; PH 45)

Senate approved relevance

Training and graduating students who are highly skilled and knowledgeable in Production of Biologicals, 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 NDU 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 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, 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

Objective

The objectives of this course is enable students to

1. explain 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. explain packaging and labeling of least 5 laboratory biologicals and diagnostic reagent products ;
6. carry out quality control and standardization 2 laboratory biologicals and diagnostic reagent products ; and
7. demonstrate laboratory waste disposal .

Learning Outcomes

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

1. explain 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 5 quality control and validation of the ingredients required for the production of at least 2 laboratory biologicals and diagnostic reagents ;
4. carry out 5 quality control and validation for at least 2 laboratory biological and diagnostic reagent products ;
5. explain packaging and labeling of at least 5 laboratory biologicals and diagnostic reagent products ;
6. carry out quality control and standardization 2 laboratory biologicals and diagnostic reagent products ; and
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 of 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 and 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 of biologicals. Storage of biologicals. Introduction to marketing and advertisement. Safe disposal of chemicals and methods for purifying water.

NDU –MLS 205 - Principles of Diseases (3 Units C: LH 15, PH 45)

Senate approved relevance

Training and graduating students who are highly skilled and knowledgeable in biochemical, pathological basis of diseases is in our topmost priority in NDU. NDU vision and mission is 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

The current curriculum lacks biochemical and pathological basis of diseases.

This course will provide acquisition of skills and knowledge in the etiology and pathogenesis of disease processes, pathological processes that lead to changes in diseased organs and tissues how these relate to clinical signs and symptoms, pathological basis of diseases that are commonly

seen in clinical practice, correlate pathological state with laboratory results and compare acute and chronic diseases.

Objectives

The objectives of this course is enable students to

1. describe the aetiology and pathogenesis of disease processes ;
2. explain the pathological processes that lead to changes in diseased organs and tissues how these relate to clinical signs and symptoms ;
3. identify pathological basis of diseases that are commonly seen in clinical practice ;
4. explain pathological state with laboratory results ;
5. compare acute and chronic inflammation ; and
6. Identify disease sequel in humans and animals .

Learning Outcomes

At the end of the course, students are able to:

1. describe the aetiology and pathogenesis of 10 disease processes ;
2. explain the pathological processes that lead to changes in diseased organs and tissues how these relate to clinical signs and symptoms ;
3. identify 5 pathological basis of diseases that are commonly seen in clinical practice ;
4. explain pathological state with laboratory results ;
5. differentiate between acute and chronic inflammation ;
6. identify 5 disease sequel in humans and animals ;

Course Contents

The normal cell and the adopted cell. cell injury and cell death. introductory to general and systemic pathology. characteristics and classification of diseases of various body systems such as cardiovascular (hypertension, angina pectoris and other vascular diseases, cardiac arrhythmia and heart failures). endocrinological and highlight the organisational functions, hypophyseal hormones and pineal gland, ACTH, insulin, glucagon, parathyroid, sex hormones, pregnancy and lactation; body's reaction to disease-inflammation, immunity and immunological and genetic factors in disease, adverse drug reactions. Pathology (pathophysiology, disease processes to a stage 1 tertiary standard) to include a basic principle and understanding of pathology including the role of micro-organisms in health and disease. Chronic and infectious diseases (such as fungal, viral and parasitic), deficiency diseases, protein-calorie malnutrition, vitamins and mineral deficiency, endocrine, metabolic, neurological and emotional diseases. Neoplasia; diverse drug reactions as well as the clinical aspects.

NDU-MLS -207 General Pathology I (3 Units C: LH15, PH 45)

Senate approved relevance

Producing graduates who are highly skilled and knowledgeable in laboratory medicine is in accord with NDU 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 to provide preliminary knowledge on pathology for advance knowledge in laboratory medicine and its application in the laboratory diagnosis of diseases.

The course will equip leaner's with the concept of pathology, identification of etiologic factors of disease, causes and mechanism of cell injury including free radical injury, cell death and apoptosis, describe the adaptations of cell growth and differentiation, hypertrophy, hyperplasia, metaplasia and atrophy, explain the processes of cutaneous wound healing and repair, describe cell cycle and define acute inflammation, basic knowledge in inflammation, vascular and cellular events in acute inflammation, mediators of acute inflammation, vaso-active amines, plasma derived, serous/fibrinous inflammation, outcome of inflammation, chronic inflammation, granulomatous inflammation, systemic effects of inflammation; and consequences of deficient/excess inflammation.

Objectives

The objectives of this course is enable students to

1. explain pathology;
2. describe the aetiologic factors of disease;
3. describe causes and mechanism of cell injury including free radical injury, cell death and apoptosis;
4. describe the adaptations of cell growth and differentiation, hypertrophy, hyperplasia, metaplasia and atrophy;
5. explain the processes of cutaneous wound healing and repair;
6. describe cell cycle and define acute inflammation;
7. discuss causes of inflammation, vascular and cellular events in acute inflammation;
8. explain mediators of acute inflammation, vaso-active amines, plasma derived, serous/fibrinous inflammation;
9. explain outcome of inflammation;
10. describe chronic inflammation, granulomatous inflammation;
11. discuss systemic effects of inflammation; and
12. describe the consequences of chronic inflammation.

Learning Outcomes

At the end of this course, students are able to:

1. define pathology;
2. list 10 etiologic factors of disease;

3. describe the 2 causes and mechanism of cell injury including free radical injury, cell death and apoptosis;
4. describe the adaptations of cell growth and differentiation, hypertrophy, hyperplasia, metaplasia and atrophy;
5. explain the processes of cutaneous wound healing and repair;
6. describe cell cycle and define acute inflammation;
7. discuss causes of inflammation, vascular and cellular events in acute inflammation;
8. explain 5 mediators of acute inflammation, vaso-active amines, plasma derived, serous/fibrinous inflammation;
9. explain 5 outcome of inflammation;
10. describe chronic inflammation, granulomatous inflammation;
11. discuss systemic effects of inflammation; and
12. describe 5 consequences of chronic inflammation.

Course Contents

Introduction, basic definitions, aetiology of disease. Cell injury, cellular adaptation, cell death (necrosis and apoptosis). Free radicals. Ischemic cell injury. Cutaneous wound healing and repair. Inflammation, definition and causes of acute inflammation. Vascular and cellular events in acute inflammation. Mediators of acute inflammation (vaso-active amines, plasma derived). Serous/fibrinous inflammation, chronic inflammation, granulomatous inflammation. Systemic effects of inflammation. Consequences of deficient/excess inflammation. Genetic disorders, classification (chromosomal, single gene and multifactorial). Chromosomal disorders (Down, Turner, Klinefelter, Edwards syndromes). Single gene disorders (classic and non classic). Mutations and multifactorial disorders. Congenital anomalies, types, aetiology. Teratogenesis.

NOTE: Progression from 200 level to 300level is based on passing all basic science courses (Physics, chemistry, mathematics, biology, Anatomy, Physiology and biochemistry) offered at 100 and 200level. Students must not have more than one (1) GST course as approved by the senate

300 Level

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

Learning Outcomes

At the end of the course, students should be able to:
1. analyse the concepts of peace, conflict and security;
2. list major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe roles of international organisations, media and traditional institutions in peace building.

Course Contents

Concepts of Peace, Conflict and Security in a multi-ethnic nation. Types and Theories of Conflicts: Ethnic, Religious, Economic, Geo-political Conflicts; Structural Conflict Theory, Realist Theory of Conflict, Frustration-Aggression Conflict Theory. Root causes of Conflict and Violence in Africa: Indigene and settlers Phenomenon; Boundaries/boarder disputes; Political disputes; Ethnic disputes and rivalries; Economic Inequalities; Social disputes; Nationalist Movements and Agitations; Selected Conflict Case Studies – Tiv-Junkun; ZangoKartaf, Chieftaincy and Land disputes and many others. Peace Building, Management of Conflicts and Security: Peace & Human Development. Approaches to Peace & Conflict Management --- (Religious, Government, Community Leaders and many others.). Elements of Peace Studies and Conflict Resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and Terrorism. Peace Mediation and Peace Keeping. Peace & Security Council (International, National and Local levels) Agents of Conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution, ADR. Dialogueb). Arbitration, c). Negotiation d). Collaboration and many others. Roles of International Organisations in Conflict Resolution. (a). The United Nations, UN and its Conflict Resolution Organs. (b). The African Union & Peace Security Council (c). ECOWAS in Peace Keeping. Mediaand Traditional Institutions in Peace Building. Managing Post-Conflict Situations/Crisis: Refugees. Internally Displaced Persons, IDPs. The role of NGOs in Post-Conflict Situations/Crisis.

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

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;
7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship; and
9. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity Identification (Sources of business opportunities in Nigeria, Environmental scanning, Demand and supply gap/unmet needs/market gaps/Market Research, Unutilised resources, Social and climate conditions and Technology adoption gap). New business development (business planning, market research). Entrepreneurial Finance (Venture capital, Equity finance,

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

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

Learning Outcomes

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

1. convert results from one unit format to another using si unit system;
2. describe the physiology and biochemistry of the gastric secretion;
3. list the test in urinalysis and microscopy profile;
4. describe how laboratory tests are used in these disorders;
5. discuss the mode of action of hormones in carbohydrate metabolism; 6. discuss the type of lipids;
7. describe the measurement of plasma lipid and lipoproteins;
8. outline the factors affecting synthesis of protein;
9. explain the functions of kidney; and
10. outline the causes of acidosis and alkalosis.

Course Contents

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

Carbohydrate metabolism: Blood glucose homeostasis; hyperglycaemia diabetes mellitus – its causes and investigation; Hypoglycaemia – types causes and investigation.

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

Learning Outcomes

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

1. discuss the basic concepts of origin, development and functions of blood cells;
2. describe the methods of Haemoglobin estimation;
3. describe the methods of cell counting;
4. state simple tests used in blood coagulation; and
5. explain blood films-normal and abnormal.

Course Contents

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

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

Learning Outcomes

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

1. describe the classification and nomenclature of microorganisms;
2. explain the general properties of bacteria, structure, growth and reproduction requirements;
3. state the general properties, structure and biology of viruses;
4. describe the characteristics and general features of fungi and their diseases; and
5. discuss about identification and demonstration of pathogens in the laboratory.

Course Contents

Scope of microbiology: Historical approach and many others. Classification and nomenclature of microorganisms. Introduction to the microbial world; Introduction to Bacteriology, Mycology, Virology and Parasitology (the protozoan). Bacteriology: The general properties of bacteria, structure, growth, reproduction, requirements both environmental and nutritional. Aspects of Bacterial metabolism, bacterial genetics and variation. Sterilisation in Microbiology, bacteria in health and disease: Antibiotics and chemotherapy; infection and immunity; introduction to laboratory techniques and methods including serology. Viruses: General properties, structure and biology of viruses, classification – various methods, reproduction, resistance, pathology, purification of viruses, propagation of viruses, immunity and diagnosis of viral infection, interferon and interference, inclusion bodies, cytopathic effects. Viralhost interactions and

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

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

Learning Outcomes

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

1. discuss basic concepts of common fixing agents;
2. describe the uses of fixing agents in Histopathology laboratory;
3. explain basic histology of organs;
4. describe tissue sectioning procedures; and
5. conduct slide preparation and slides examination to illustrate normal and abnormal features.

Course Contents

Introduction to Histopathology. Fixation – Autolysis, bacterial decomposition. Effects of fixation, common fixing agents and their uses. Secondary fixation, post-fixation and post-chroming and post-mordanting. Fixation pigments, Decalcification – Aims and applications, decalcifying agents. Tests for clearing of decalcification. Dehydration, clearing and infiltration/embedding. Frozen and celloidin sections. Embedding media. Basic histology of organs. Principles and application of Exfoliate Cytology. Collection and fixation of specimens for cytological examination. Museum technique-colour restoration. Mounting in museum jars. Tissues and cellular injury inflammation. Healing and repairs. Gross appearance of diseased organs in routine post-mortem examination. Slide sections to illustrate common tumours.

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

Learning Outcomes

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

1. explain the basic concepts of immunology;
2. appreciate and explain animal vaccine production; and
3. appreciate and explain human vaccine production.

Course Contents

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

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

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

1. state hazards encountered in medical laboratories and the safety precautions to be applied to avoid disaster;
2. describe how to set up common laboratory equipment like microscope, autoclave and their application;
3. describe how laboratory specimens are collected and processed; and
4. discuss the basic organisation of a medical laboratory.

Course Contents

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

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

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

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

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

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

Medical Microbiology and Parasitology: Safety precautions in the Microbiology laboratory. Getting acquainted with basic tools of microbiologist. Preparation of films and basic staining techniques, the Gram stain, Ziehl-Nielsen stain, spores, capsule and negative staining procedures. Wet preparation and microscopy, Motility tests, Media preparation and culturing. Plate reading. Demonstration of the ubiquity of micro-organisms especially bacteria from different environment. Recognition of different types of haemolysis. Sensitivity testing. Use of autoclave. Wet mount for parasites. Identification of trophozoites, cysts and ova of different protozoa and helminths in stool. Thin and thick films preparation for malaria microfilaria and Trypanosome parasites. Staining techniques: Giemsa, Wrights, Fields and Leishman Stains. Identification of Trichomonas spp, Paragonimus spp, Trichuris spp, Schistosoma spp, other Helminthes and protozoa of medical importance. Skin snips. Urine microscopy. Concentration techniques for stool and sputum for ova and cysts. Examination and recognition of Helminthes from tissue Biopsy.

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

Learning Outcomes

At the end of this course, students should be able to:
1. discuss the components of ABO;
2. explain Rhesus blood group systems;
3. acquire the skill for blood grouping techniques;
4. appreciate the anomalies in ABO grouping;
5. identify the subgroups of ABO system and variants of Rh system; and
6. describe organisational structures of the Blood Bank, facilities and reagents.

Course Contents

ABO and Rhesus Blood Groups, Inheritance, distribution and Genetic Theory. Blood Grouping Techniques – principles, disadvantages and advantages. Preparation of antisera – antiserum titration, avidity, Potency and specificity. Plant lectins –Preparation and Standardisation of antisera from lectins such as Dolichos biflorus Anticoagulants used in BGS, ACD, CPD-CPA-A and many others. Modes of Action, Side effects. Blood Bottles (MRC) and Plastic Bags – Advantages and disadvantages. Donor Screening- using CuSO4 method – other methods of screening. Preparation of blood products – cryoprecipitate, platelet rich plasma, packed cell fresh frozen plasma, fibrinogen and many others. Storage of blood and blood products – various methods, advantages and disadvantages Blood banking-organisation, structures, facilities and records. Blood group specific substances – synthesis, identification method(s) and application. Quality control of physical, chemical and reagent. Practical/tutorials ABO and Rhesus grouping methods, Antiserum Titration DCT and ICT antibody screening.

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

Learning Outcomes

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

1. explain basic concepts of protozoa; 2. discuss the basic concepts of helminthes of medical importance; 3. describe the methods of demonstration of parasites in clinical samples;

4. discuss the basic concepts of Arthropods of medical importance; and

5. empower students with knowledge vectors of important diseases of man.

Course Contents

Introduction to the parasites. Classification of protozoa, (the amoebas, the ciliates, the flagellates, Nematodes. (Ascaris, Strongloides, Trichuris, guineaworm, hookworms, Trichinella, Enterobius and many others). Life cycle and pathogenicity of Cestodes. (The tapeworms, Larval forms of cestodes). Life cycle and pathogenicity of the Trematodes (The Schistosome, Fasciola, Paragonimus, and many others). Methods of demonstration of parasites in blood, faeces, vagina, urine, urethra, pus from lung and liver, skin snips, and many others. Mechanisms of their disease production; Epidemiology and control of parasitic diseases.Arthropods of medical importance particularly members of the class Diptera, the crustaceans, Arachnida, Hexapoda, Myiasis and many others, their biology, life cycles and control. Life history as disease vectors; various diseases of importance transmissible by insects. Biology of mosquito in relation to transmission of malaria, filariasis, viral infections and many others.

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

Learning Outcomes

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

1. describe the basic concepts of principles of use and maintenance repair of common apparatus and laboratory equipment; and

2. acquire skill of repair of common apparatus and laboratory equipment.

Course Contents

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

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

Learning Outcomes

At the end of this course students should be able to;

1. identify the factors that influence the absorption of an orally administered drug;
2. relate the factors that influence the rate of drug elimination;
3. define drug distribution and factors that influence it;
4. describe the major toxicities of the drugs prescribed;
5. explain the role of the Medical Laboratory in the evaluation of exposure to poisons; and
6. define pathologic mechanisms of toxicants.

Course Contents

Scope of Pharmacology. Origin and sources of drugs, routes of administration of drugs, drug receptors and receptor isolation. Pharmacokinetics, absorption of drugs excretion, biotransformation. Structure-activity relationship. Mode of action of drugs. Types of drug action. Drug action in man-compliance, individual variations, presence of other drugs, genetic effects, tolerance and tachyphylaxis, effects of diseases, drug toxicity adverse drug reactions, drug dependence and drug interactions. Antimicrobial Pharmacology chemotherapeutic agents, antimetabolic base analogues, mitotic inhibitors, antibiotics, enzymes, alkylating agents and hormones. Radiation therapy, immune therapy and cancer therapy, synthesis and physiology ofneurotransmitters Biochemical basis of depression. Marcotics-Mechanism of action. Fluorescent, radio and chromatographic methods in drug studies. Methods of evaluation of toxins mutagens and carcinogens, neurotransmitters Biochemical basis of depression. Marcotics-Mechanism of action. Fluorescent, radio and chromatographic methods in drug studies. Methods of evaluation of toxins mutagens and carcinogens.

NDU- MLS 312 Molecular Biology and Microbial Genetics (**2 Units C: LH 15; PH 45**)

Senate approved relevance

Training and graduating students who are highly skilled and knowledgeable in Molecular Biology and Microbial Genetics is in line with NDU vision and mission, 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 and Microbial Genetics is to provide laboratory diagnostic solutions to emerging and re-emerging infectious diseases.

The course will equip students with basic and applied knowledge in the structures and functions of DNA, RNA and proteins, genome organization of prokaryote and eukaryote, biological events in DNA replication and gene expression, types and outcomes of mutation , DNA recombination

and its applications in genetically modified organisms and molecular biology techniques such as DNA extraction and electrophoresis

Objectives

The objectives of this course is to enable students to:

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 are able to:

1. describe the components of the structure of DNA, RNA and proteins and state 10 functions of each of the DNA, RNA and proteins ;
2.. explain 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. describe DNA recombination and its applications in genetically modified organisms ; and
6. demonstrate RNA and DNA extraction and electrophoresis.

Course Contents

Historical perspectives of Nucleic acids (DNA and RNA). Review of structure and function of nucleic acids. 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. Applications of microbial genetics.

NDU–MLS 315 -General Pathology II (2 Units C: LH 15, PH 45)

Senate approved relevance

Producing graduates who are highly skilled and knowledgeable in advanced laboratory medicine is in accord with NDU 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 II is advancement on the prerequisite course that is General Pathology I.

General Pathology II will provide a post-basic knowledge in, immunity and immune system, 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.

Objectives

The objectives of this course is to enable students to

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

Learning Outcomes

At the end of this course students are able to

1. discuss immunity and immune system ;
2.explain immunopathology ;
3.define oedema, embolism, thrombosis and shock ;
4.explain pathophysiologic mechanisms and pathogenesis underlying oedema, embolism, thrombosis and shock ;
5.describe morphologic and clinical features of oedema, embolism, thrombosis, shock ;
6. describe types of pathologic calcification ; and
7.explain fatty change and cellular accumulations of protein, glycogen and pigments.

Course Contents

Immunopathology. Innate and adaptive immunity. Components of immune system (cells, tissues and molecules). Hypersensitivity disorders. Major histocompatibility complex. Mechanism of tolerance. Autoimmunity. Primary immunodeficiencies. AIDS. Amyloidosis. 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. Tumour immunity. Effect of tumour on host. Paraneoplastic syndromes. Intracellular accumulations. Pathologic calcification. Intracellular accumulations of protein. Lipids, glycogen and pigments. Infectious diseases. Malaria. Tuberculosis. Leprosy. Schistosomiasis. Syphilis. Amoebiasis. Typhoid. Onchocerciasis

NDU-MLS 317 Toxicology (2 Units C: LH 15, PH 45)

Senate approved relevance

Producing graduates who are highly skilled and knowledgeable in medical toxicology is in accord with NDU vision to be a world class university in producing BMLS graduates who are leaders in medical toxicology and can work anywhere in the world.

Overview

Medical toxicology is to provide laboratory diagnostic information on preventive and curative organ, tissue and cell destructions.

The course will equip students with quality knowledge in basic concepts of toxicology, types of toxicology; classes of toxicology, importance of toxicology in environmental health care, principles of chemical pathology, Environmental Toxicants/poisons, pathways such as skin, mouth, nose and many others; compare LD50 and LC50., basic pathophysiology of toxicant on cells, organs and systems, principles of probit analysis, methods in the prevention and control of environmental poisons, common food additives and their public health importance, toxicants of environmental and public health concern, medical and environmental toxicants; drugs and substances that are commonly abused, toxicants inherent in mining activities in Nigeria,approach in poison prevention and control, signs, symptoms and management of poisoning, biological poisons from snake, scorpion and dog, use of anti-venoms in the management of biological poisoning, nanotoxicology, types of Xenobiotics in the environment; and Antimicrobial Resistance (AMR) in the environment.

Objectives

The objectives of this course is enable students to

1. explain the basic concepts of toxicology ;
2. describe the different types of toxicology agents ;
3. explain the classification of toxicology ;
4. explain the importance of toxicology in environmental health care;
5. state the principles of chemical pathology ;
6. identify common Environmental Toxicants/poisons;
7. discuss exposure pathways such as skin, mouth, nose and many others;compare LD50 and LC50 ;
8. discuss the basic pathophysiology of toxicant on cells, organs and systems ;

9. explain the principles of probit analysis;
10. describe methods in the prevention and control of environmental poisons;
11. highlight common food additives and their public health importance;
12. describe toxicants of environmental and public health concern;
13. compare medical and environmental toxicants;
14. highlight drugs and substances that are commonly abused;
15. explain toxicants inherent in mining activities in Nigeria;
16. outline the general approach in poison prevention and control;
17. explain signs, symptoms and management of poisoning;
18. demonstrate biological poisons from snake, scorpion and dog;
19. explain the use of anti-venoms in the management of biological poisoning;
20. discuss nanotoxicology;
21. enumerate various types of Xenobiotics in the environment; and
22. discuss Antimicrobial Resistance (AMR) in the environment.

Learning Outcomes

At the end of this course, students are able to:
1. describe the concept of toxicology
2. outline the different types of toxicology agents;
3. classify toxicology;
4. list the 10 importance of toxicology in health care;
5. state the principles of chemical pathology;
6. identify common Environmental Toxicants/poisons;
7. discuss exposure pathways such as skin, mouth, nose and many others;
8. differentiate LD50 and LC50. ;
9. explain the basic pathophysiology of toxicant on cells, organs and systems;
10. state the principles of probit analysis;
11. describe methods in the prevention and control of environmental poisons;
12. list common food additives and their public health importance;
13. appraise toxicants of environmental and public health concern;
14. distinguish medical and environmental toxicants;
15. list drugs and substances that are commonly abused;
16. elaborate toxicants inherent in mining activities in Nigeria;
17. outline the general approach in poison prevention and control;
18. explain signs, symptoms and management of poisoning;
19. analyse biological poisons from snake, scorpion and dog;
20. explain the use of anti-venoms in the management of biological poisoning;
23. enumerate various types of Xenobiotics in the environment; and
24. describe Antimicrobial Resistance (AMR)

Course Contents

Introduction to toxicology and environmental toxicology: - classification and types of toxicology. Concept of LD and LC. Dose response analysis. Importance of toxicology in public health, introduction to chemical pathology. Toxicodynamics and toxicokinetics. toxicants of environmental and public health concern:- lead poisoning, Pesticides, hydrocarbon poisoning, cyanide, house hold toxicants, medical toxicants:- aspirin, barbiturate, acetaminophen, environmental toxicants and xenobiotics:- carbonmonoxide poisoning, food borne poisons, nitrogen oxide poison, sulphur oxide poison, drugs of abuse:- alcohol, nicotine toxicity, opiod; mining toxicants such as lead, mercury, uranium, arsenic, and many others. other toxicants:-heavy metals, radioactive materials, food additives, animal toxins, phytotoxins, plastics and psychogenic drugs. Toxic pollutants in air, land and water. Exposure pathways, standards and health implications. System, Organ, Tissue and Cell pathophysiology. Probit analysis; general approach in poison prevention and control; poisoning signs, symptoms and management; biological poisons:- snake, scorpion and many others venom. Basics of nanotoxicology; basics of forensics in EH; Antimicrobial Resistance (AMR) in the environment.

NDU-MLS 341 Basic Cytology (2 Units; C; LH=15; PH 45)

Senate Approved Relevance

Cytology is an indispensable instrument for the prevention, diagnosis, monitoring, and treatment of diseases, particularly malignant conditions. A lack of organized, systematic, population-based cancer screening programmes is evidenced by the increased prevalence of cancer within the Nigerian population and Bayelsa State in particular, as well as the obvious manpower demand. Creating a groundwork that responds to societal needs is crucial. Medical laboratory science graduates will all benefit greatly from taking this course. Those who took histopathology and cytology in their last year of school would have been better prepared to meet clients' expectations for competent service delivery in this setting and to compete internationally. The World Health Organization (WHO) has long recognized and advocated cervical cytology (Pap screening) as the first line of cancer of the uterine cervix prevention and diagnosis.

Overview

Cytology is the study of cells at the microscopic, ultrastructural, and molecular levels. It is utilised in the screening and early detection of cancer, the diagnosis of cancer and other diseases, such as infections and benign disorders, the monitoring of treatment, and the provision of scientific data to support clinical treatment decisions. It is applicable to both clinical and veterinary medicine.

The cytological examination entails meticulous, appropriate specimen collection from the correct anatomical site, prompt preservation with an appropriate fixing agent, laboratory processing to produce a diagnostic slide, and microscopic examination of the cellular features on the slide while correlating findings with clinical, radiological, and other laboratory findings. The cells under study

may be lost spontaneously from body surfaces (exfoliative cytology), scraped from body surfaces (abrasive cytology), or extracted with a needle and syringe from a body site (aspiration cytology).

Objectives

The objectives of this course is enable students to:

1. describe the workflow in a cytology laboratory;
2. discuss risks associated with cytology laboratory procedures and safety measures;
3. describe how reagents are prepared for use in the cytology laboratory;
4. explain the principles of staining from a theoretical point of view, especially the Pap staining technique;
5. describe various cytological staining procedures; and
6. explain the steps involved in the preparation of cytology materials.

Learning Outcome

On completion of the course, students are able to:

1. describe the workflow in a cytology laboratory;
2. discuss 5 risks associated with cytology laboratory procedures and safety measures;
3. describe how 5 reagents are prepared for use in the cytology laboratory;
4. explain the principles of staining from a theoretical point of view, especially the Pap staining technique;
5. describe 5 cytological staining procedures; and
6. explain the steps involved in the preparation of cytology materials.

Course Contents

A brief history of cytology. General features of normal cells.. Fixation and fixatives used in cytology. Reagent preparation for cytological procedures. Specimen adequacy criteria for various cytological specimens. Specimen collection methods, procedures, and limitations in cytological investigations. Cytology specimen accessioning in the laboratory. Good cytology laboratory practice. Cytology laboratory risk assessment and management. Smear preparation techniques to cover both conventional and liquid-based cytology – direct smears, cytospin smears and automated systems. Preparation of cytology specimen for shipment. Theory of cytological staining. Cytology staining techniques – Paps, H&E, MGG, Giemsa, Shorr's, vital and supravital staining. Cytochemical and immunocytochemical techniques. Mounting and labeling cytology slides. Slide marking conventions in cytology. Slide microscopy and evaluation of slide quality for diagnosis. Identification of premalignant lesions in gynaecologic smears. Tumour classification. General features of malignant cells. Sex determination by Barr body staining and identification. Cytohormonal evaluation – specimen collection, staining, slide examination, indices for assessment, and reporting patterns. Cell Block preparation techniques and uses of cell block.

NDU-MLS 332 Introduction to Public Health (2 Units; C; LH15; PH45)

Senate approved relevance

Training and graduating students who are highly skilled and knowledgeable in public health which is in line with the MLSCN act of 2003 which was not covered by the former curriculum is in accord with NDU vision to be a world class university in producing BMLS graduates who are leaders in public health 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, 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

Objectives

The objectives of this course is enable students to

1. define disease ;
2. differentiate public health from health care delivery ;
3. describe processes in vaccine production ;
4. describe public health services, components and core sciences ;
5. explain the determinants of diseases ; and
6. explain mode of disease transmission .

Learning outcome

At the end of the course students are able to

1. define diseases;
2. differentiate public health from health care delivery ;
3. describe processes in vaccine production ;
4. describe public health services, components and core sciences ;
5. explain the determinants of diseases ; and
6. explain mode of disease transmission.

COURSE CONTENT

Definition of disease. classification of diseases. public health system versus health care system. Primary and secondary health care. disease surveillance. public health approaches in disease survelliance. public health core sciences and components. public health services and strategies. Vaccines and immunization. Vaccine production. epidemiology: diseases and determinants of diseases. pandemics, epidemics and endemics. Mode and route of transmission of diseases, disease prevention strategies. Sensitization and public awareness . international control of diseases.

NDU-MLS-362 Introduction to Coagulation Studies (2 units; C; LH 15; PH45)

Senate-approved relevance

The philosophy of Introduction to Coagulation Studies which is line with the vision of Niger Delta University is to produce graduates who are skilled and proficient in performing effectively in clinical diagnostic services and research in coagulation tests using manual and semi-automated procedures.

Overview

Coagulation is the physiological process by which a blood clot is formed. The formation of a clot is necessary in order to arrest the loss of blood from a ruptured vessel. Coagulation studies help in the understanding of blood disorders and the diagnosis of the bleeding.

Coagulation studies also help in the diagnosis of liver disease or a vitamin K deficiency. In traumatic episodes, when a damage or injury is sustained, the body depends on specific interactions between the plasma–based coagulation factors, blood platelets, and the endothelium of the blood vessels. Coagulation studies measure these interactions in the blood. The skills to perform coagulation tests during surgeries, severe bleeding in trauma and some genetic disorders like haemophilia is very vital component in the training of a Medical Laboratory Scientists.

Objectives: The objectives of this course is enable students to

1. define coagulation;
2. Identify the pathways to coagulation;
3. Identify the coagulation factors and their respective pathways;
4. Identify the common coagulation tests used to monitor hemostasis;
5. Identify normal values for common coagulation tests, and.
6. List drugs that affect prothrombin time and activated partial thromboplastin values.

Learning Outcomes: At the end of this course, the student should are able

1.define coagulation;
2.Identify the pathways to coagulation;
3.Identify the coagulation factors and their respective pathways;
4.Identify the common coagulation tests used to monitor hemostasis;
5.Identify normal values for common coagulation tests, and.
6.List drugs 10 that affect prothrombin time and activated partial thromboplastin values.

Course Contents

Define Coagulation. Differentiate between in vitro and in vivo. Intrinsic and Extrinsic coagulation Pathways. Coagulation cascade. Role of Calcium in the Coagulation Cascade. Prothrombin and Thrombin. specimen collection in coagulation testing. anticoagulant, ratio. quality assurance. measure and monitor of patients on anticoagulant drugs. reagents used in aPTT testing. reagents used in PT testing. normal range for PT and aPTT. Coagualtion profile in heath and disease.

factors affecting coagulation values. Coagulatin values and implication . effect of certain drugs on coagulation dynamics.

400 Level

MLS 401: Laboratory Management and Functions and General Laboratory Practice (2 Units C: LH 15; PH 45)

Learning Outcomes

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

1. discuss the basic concepts of medical laboratory design;
2. discuss planning and organisation;
3. explain accounts and budgeting, ordering, stock – card indexing;
4. describe storage and occupational hazards;
5. explain theory and practice of some common analytical techniques including tissue processing;
6. describe microscopy and other basic Microbiological Equipment use;
7. discuss the principles of Histological Equipment; and
8. discuss the principles and working of haematological and clinical chemistry equipment.

Course Contents

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

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

Learning Outcomes

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

1. acquire knowledge and skill on the laboratory management of different types of anaemia; and
2. acquire knowledge and skill on the laboratory identification of different Leukaemia

Course Contents

Iron metabolism, folate and B2 metabolism. Nomenclature, classification and investigation of common haemoglobinopathies, haemolytic anaemias, myeloproliferative disorders,

lymphoproliferative disorders, haemostasis and disorders of haemostasis; investigation of bleeding disorders. Bone marrow. Practical classes.

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

Learning Outcomes At the end of this course, students should be able to:
1. discuss basic concepts of the cytology of normal cells;
2. describe the epithelial cells; and
3. discuss atypical and malignant cells.

Course Contents
DNA – demonstration by Feulgen techniques. Silver impregnation methods. Genes and genetic code. Tissue culture techniques; chromosome analysis. Autoradiography – Definition and principle of organisation of a medical museum. Methods of colour maintenance. Fixation and storage of museum specimens. Special museum techniques such as Dawson's Method. Principle of Photography Preparation of stained sections for micro photography. Preparation of specimens for preparation of stained sections for micro photography. Cytological normal cells. Histology of tissues. Atypical and malignant cells. Collection of cytological smears and processing and screening. Principles of general pathology. Systemic pathology. Gastrointestinal tract. Urogenital, cutaneous. Principle of Electron microscopy materials for electron microscopy. Respiratory – Tuberculosis. Nephropathy associated with infestations and infections. Embalming techniques and demonstrations and infections. Practical based on the topics.

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

Learning Outcomes
At the end of this course, students should be able to:
1. describe the basic concepts of epidemiology of communicable diseases;
2. discuss disease spectrum; and
3. explain basic concepts of disease control.

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

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

Learning Outcomes

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

1. describe the principles instrumentation; 2. explain care of basic equipment;
3. describe the theory and practice of some common Analytical techniques; and
4. discuss automation used in Medical Laboratory Science.

Course Contents

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

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

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

1. conduct a research project;
2. discuss the role of research in health and social welfare; and
3. discuss the designing a questionnaire.

Course Contents

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

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

Learning Outcomes

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

1. discuss the basic tests expected to be carried out;
2. deliver accurate and reliable results of basic laboratory test;

3. recognise and practice as a team in the laboratory with the soul aim of producing cost effective results for the management of patient;
4. recognise and refer complex test to experience scientists; and
5. guide junior students.

Course Contents

Basic medical laboratory tests in Medical Microbiology/Parasitology including Virology, Mycology and Bacteriology, chemical pathology, Haematology and Blood Transfusion science and Histopathology. Such tests include detection of malaria parasites in blood and intestinal parasites in stool. Wet preparation and Gram staining of biological specimens. Preparation of media and inoculation of specimen. Determination of Hb, PCV and processing of blood samples for Haematology and blood Transfusion examinations. Screening of blood donors and Determination of ABO and Rhesus blood groups. Urinalysis, estimation of glucose, urea. Processing of Histopathology specimens including fixation, staining and cutting of tissues.

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

Learning Outcomes

At the end of this course, students should be able to: 1. acquire knowledge and skill required for the laboratory investigation of porphyrinaemia; 2. describe the laboratory investigation of porphyria; and 3. discuss laboratory investigation of porphyrinuria. Course Contents Porphyrin, causes, symptoms and laboratory investigation of porphyrinaemia, porphyria and Porphyrinuria, Haemoglobin, synthesis, function. Glycosylated haemoglobins. Abnormal haemoglobins and haemoglobinopathies, Liver function Tests. Mechanism of Enzyme action and kinetics: Clinical Enzymology; Isoenzymes in medicine, Coenzymes and Vitamins. Definition, causes, consequences and investigation of some inborn errors of metabolism; Phenylketonuria, galactosaemia fructose intolerance, Albinism, aminoaciduria, Endocrine glands and functions; the hypothalamus, the pituitary, the parathyroid, adrenal cortex, adrenal medulla, the gonads and reproductive endocrinology. Foeto-placental function. Calcium and bone metabolism. Pancreatic function tests. Basic neurochemistry, CSF – normal composition and changes in disease.

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

Learning Outcomes

At the end of this course, students should be able to:
1. discuss the components of ABO; and
2. acquire the knowledge of Rhesus blood group systems.

Course Contents

Blood groups – Other blood groups such as MNS, Duff, Kell, Kidd and many others. Grouping techniques and antibody screening, clinical significance, secretor status, antenatal Serology – screening and Titration. Compatibility procedures – different methods, advantages and

disadvantages, Blood Transfusion reactions – causes and types; Investigation, Risks attendant in blood transfusion – Diseases, Anaphylactic, haemolytic and allergic reactions. Screening of Donor blood for disease agents such as HbAgs, HIV, VDRL. Practical/tutorials. Compatibility procedures – advantages and disadvantages. Practical based on the above topics.

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

Learning Outcomes

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

1. discuss ethics in the practice of Medical Laboratory Science;
2. emphasise the significance of ethics of practice and confidentiality of results;
3. discuss the Ethical issues involved in private practice; and
4. describe the relationship between the Medial Laboratory Scientist and other members of the Health team.

Course Contents

Introduction to the Science and profession of Medical Laboratory Science. The different arms of medical Laboratory Sciences. Hall marks characterizing the lives of all professions; licensing to practice, Group culture patterns. Justice, rights and responsibilities as a professional. The concept of duty, professional standards and Laboratory management. Authority and discipline. The use of reason. Personal relationships – inter and intra professional, Act of good faith. Place of religion in the hospital. Value judgment, exercise of professional judgment, skill and care charge and wellbeing of patients. Patients - professional relationship – confidentiality, communication skills; trust; seeking to safe guard patients, particularly in respect to health and safety and information. Research training, professional development, knowledge and skill, quality control in the field of medical laboratory sciences and practice: Reputation. Fulfilment of professional role with integrity, refraining from its misuse to the detriment of patients, employers and colleagues. Medico-legal aspects.

NDU-MLS - 423 Medical Laboratory Supply Chain Management (2 Units C: LH 15; PH 45)

`Senate approved relevance

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

Overview

Medical Laboratory Supply Chain Management is to provide skills and knowledge on how to manage laboratory commodities to prevent commodity out of stock.

The course is to equip with skills and knowledge to explain procurement and supply chain management, Standard Operation Procedure, describe logistics Management Information System, demonstrate product selection, quantification, procurement. inventory management, storage and distribution, state Laboratory Services—Tests and commodities for laboratory Services and explain the policies and standardization of laboratory services.

Objectives

The objectives of this course is to enable students to:

1. explain procurement and supply chain management ;
2. describe Standard Operation Procedure ;
3. describe logistics Management Information System ;
4. demonstrate product selection, quantification, procurement. inventory management, storage and distribution ;
5. state Laboratory Services—Tests and commodities for laboratory Services ;
6. explain the policies and standardization of laboratory services.

Learning Outcomes

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

1. explain procurement and supply chain management ;
2. describe Standard Operation Procedure ;
3. describe logistics Management Information System ;
4. demonstrate product selection, quantification, procurement. inventory management, storage and distribution ;
5. state Laboratory Services—Tests and commodities for laboratory Services ; and
6. explain the policies and standardization of laboratory services.

Course Contents

Introduction to procurement and supply chain management (PSM), Introduction to Standard Operation Procedure (SOP). Serving Customers. Logistics Management Information System (LMIS). Product Selection. Quantification and Procurement. Inventory Management. Storage and Distribution. Quality Assurance and Quality Control. Staffing and Management. Policy and Regulatory Environment. Financing for Laboratory Commodities and Logistics Systems. Function and Organization of Laboratory Services. The Role of Public Health and Clinical Laboratory Services. Organizational Structure of Laboratory Services . Laboratory Services—Tests. Policies and Standardization of Laboratory Services. Commodities for Laboratory Services. Characteristics of Laboratory Commodities. Classification of Laboratory Commodities. Supply Chain Considerations for Laboratory Commodities. Medical laboratory Scientists, their roles and challenges in Public Health Supply Chain

NDU-MLS -462 Molecular Diagnostics and Bioinformatics (2 Units C: LH 15; PH 45)

Senate approved relevance

Graduates who are highly skilled and knowledgeable in Molecular Diagnostics and Bioinformatics is in accord with NDU 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 Bioinformatics is to provide skills and knowledge on the applications of molecular techniques and bioinformatics

The course is to equip with skills and knowledge 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 .

Objectives

The objectives of this course is to enable students to:

1. describe the basic concepts of polymerase chain reaction ;
2. describe the basic concepts of sequencing technologies ;
3. discuss navigation , mining and store biological data in selected data bases ;
4. discuss the basic concepts and uses of some bioinformatics/computational biology tools ;
5. Analyse and blast data generated ; and
6. Compare and contrast extraction of genomic RNA and DNA.

Learning Outcomes

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

1. describe 5 basic concepts of polymerase chain reaction ;
2. describe the basic concepts of sequencing technologies ;
3. discuss navigation , mining and store biological data in selected data bases ;
4. discuss the basic concepts and uses of some bioinformatics/computational biology tools ;
5. Analyse and blast data generated ; and
6. Compare and contrast extraction of genomic RNA and DNA.

Course Contents

Concepts and applications of Advanced techniques in molecular biology. 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 .

Folded motifs, protein remodelling and visualization. Genomics, Transcriptomics, metabolomics and metagenomics.

NDU-MLS 441- Immunopathology (2 Unit C: LH 15; PH 45)

Senate approved relevance

Graduates who are highly skilled and knowledgeable in immunological basis of diseases is in accord with NDU vision to be a world class university in producing BMLS graduates who are leaders in immunodiagnosis and can work anywhere in the world.

Overview

Immunopathology will provide basic and applied knowledge on the applications of immunological techniques in the diagnosis of diseases.

The course will equip students with basic and applied knowledge in immune response, autoimmunity, hypersensitivity reactions, immunosuppression, immunodeficiency, immunity and infections, laboratory tests to detect immunopathological states, vaccination and immunization.

Objectives

The objectives of this course is to enable students to:

1. explain immune response in diseases ;
2. describe autoimmunity ;
3. describe hypersensitivity reactions ;
4. compare immunosuppression and immunodeficiency ;
5. describe immunodeficiency states and diseases ;
6. explain the concept of immunity and infections ;
7. demonstrate laboratory tests to detect immunopathological states ; and
8. state the principles and applications of vaccination and immunization..

Learning Outcomes

At the end of this course, students are able to:

1. explain immune response in diseases ;
2. describe at least 4 auto immune diseases ;
3. describe 4 types of hypersensitivity reactions ;
4. differentiate immunosuppression and immunodeficiency ;
5. describe primary and acquired immunodeficiency states and diseases ;
6. explain the concept of immunity and infections ;
7. carry out 2 tests in each case to laboratory tests to detect autoimmunity, immunosuppression, immunodeficiency and 1 test to detect each of the hypersensitivity reactions ; and
8. state the principles and applications of vaccination and immunization.

Course Contents

Host defense mechanisms involved in both heath and illness. General overview of defects and malfunctions of innate immune response. General overview of defects and malfunctions of adaptive immune response.. Cell-mediated immunological reactions. Hypersensitivity reactions. Immunological tolerance. Autoimmunity and autoimmune diseases. Cytokine storm. Immunosuppression (causes and implications). Primary and acquired immunodeficiency (causes and diseases). Inflammation. Immunity and infections. Tumor immunology. Immune reactions in tissue damage. Immune complex diseases. Specific Diagnostic tests. Protein of fractionation. Procedures of vaccination and immunization.

NDU-MLS 451 - Tissue Slide Reading and Reporting (2 Unit C: LH 15; PH 45)

Senate approved relevance

Graduates who are highly skilled in tissue slide reading and reporting is in accord with NDU vision to be a world class university in producing BMLS graduates who are leaders and competent at reporting abnormalities or otherwise on stained tissue slides for histopathological diagnosis and can work anywhere in the world.

Overview

Tissue Slide Reading and Reporting will enable students acquire bench skills to prepare, read and report findings on stained tissue slides.

The course will equip students with the required skills to prepare, read and report findings on stained tissue slides for diagnosis of diseases. It will equip students with knowledge and skills on tissue slide for reading, writing initial comment on a stained tissue slide, produce a credible report from immunochemically stained slides, preservation of stained tissue slides for future reference , features of normal and diseased tissues, foreign substance, poison and pathogen including parasites in tissue and immunochemical reactions in tissues.

Objectives

The objectives of this course is to enable students to:

1. describe good tissue slide for reading ;
2. discuss writing initial comment on a stained tissue slide ;
3. state credible report from immunochemically stained slides ;
4. discuss preservation of stained tissue slides for future reference ;
5. describe features of normal and diseased tissues ;
6. discuss foreign substance, poison and pathogen including parasites in tissue ; and
7. discuss immunochemical reactions in tissues .

Learning Outcomes

At the end of the course , the student should are able to:

1. describe good tissue slide for reading ;
2. discuss an initial (first) opinion/comment on a stained tissue slide ;
3. explain a credible report from immunochemically stained slides ;

4. discuss stained tissue for future reference ;
5. identify normal and diseased tissues ;
6. identify foreign substance, poison and pathogen including parasites in tissue ; and
7. discuss immunochemical reactions in tissues.

Course Content

Preparation of stained tissue slides. Histological and Cytological slides. Histopathology and cytopathology slides. Histochemistry and cytochemistry. Simple tissues. Complex tissues. Features of good tissue slides and poor tissue slides. Preservation of stained tissue slides. Immuno- Histochemistry (IHC) stained tissue slides. Examination microbes in tissues. Slide reading procedures/guides. Tissue scoring. Gram-stained tissue slides. Common features of inflammation. Features of Necrosis. Evidence of healing and repair. Features of atrophy. Tumour/Cancer. Features of trauma. Evidence of toxin in tissue. Quality control in slide reading. Reporting.

NDU-MLS 491- First Professional Examination (3 Units C: LH 15 PH 60)

Senate approved relevance

Graduates who are highly skilled at providing intermediate and general medical laboratory diagnosis is in accord with NDU 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 is to enable students 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 ; and
9. demonstrate urinalysis and pregnancy tests.

Learning Outcomes

At the end of the course the student are able to:

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

Course Contents

This is a buildup 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).

First Professional Examination

This is a buildup 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)

500 Level (HISTOPATHOLOGY/CYTOLOGY)

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

Learning Outcomes

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

1. show or demonstrate competency in independent running of a medical laboratory as a full fledge professional;

2. display right administrative acumen in the running of a medical laboratory facility; and
3. impart the right knowledge and professional know how to upcoming students and scientists.

Course Contents

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

MLS 503: Practical Exercises II (2 Units C: PH 45)

Each student carries out practical based on the area of major specialty.

Special staining methods – PAS, Manson trichrome, Iron Impregnation Methods. Cytological staining methods and collection of cytological samples. Chromosome analysis. Autoradiography. Museum techniques. Cyto-screening and slide reporting. Cutting sections using the microtomes. Tissue (cell) culturing, Fungi, amyloid, enzyme and other specialized demonstration methods.

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

Learning Outcomes

At the end of the course, students should be able to:
1. explain laboratory procedures including safety precautions;
2. carry out independent researches that will lead to tangible outcomes; and
3. present outcome of their researches in seminars and conferences.

Course Contents

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

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

Learning Outcomes

At the end of this course, students should be able to:
1. identify a topic of current interest in any branch of medical laboratory science;
2. search for the appropriate literature in the chosen topic; and
3. prepare and disseminate the knowledge using the appropriate format within a time frame.

Course Contents

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

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

Learning Outcomes

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

1. describe the basic concepts of the methodology of Histochemistry; and
2. describe basic concepts of the tissue culture technique.

Course Contents

Theory and Methodology of Histochemistry – Chromaffin tissues, Schmols, Diazo and Perls and other histochemical techniques. Enzyme histochemistry: Acid and alkaline phosphatase, Oxidative enzymes. Genetic diseases. Karyotype abnormalities. Chromosome techniques. Tissue culture technique. Chromosome staining techniques Slide reporting.

NDU –MLS 551 . DIAGNOSTIC TECHNIQUES IN HISTOPATHOLOGY

(2 Units; C; LH 15; PH 45)

Senate approved relevance

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with NDU 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:

Advanced histopathology techniques is a course aimed at enlightening the students on the modern, improved and more efficient methods of applying histological techniques in disease diagnosis. In our present day, Histological techniques have progressed beyond routine paraffin tissue processing hence the need for students to learn these advanced procedures. These techniques such as fluorescent microscopy, immunohistochemistry and immunocytochemistry amongst others, though more complex than the routine processes provide increased specificity of laboratory results.

This will ultimately result in precise disease diagnosis and better patient management. This course will therefore equip students of Medical Laboratory Science with the necessary theoretical and practical knowledge of these advanced histological techniques and safety procedures involved in histopathology laboratories.

Objectives

The objectives of this course is to enable students to:

1. describe the various advanced histological techniques ;
2. state the principles behind each of these techniques ;
3. explain the various stepwise procedures involved in each technique ;
4. explain how these techniques can be applied in histological diagnosis of diseases ;
5. discuss the various equipment needed for each of these techniques ;
6. describe the working mechanisms of these equipment ; and
7. compare the advantages of these techniques over the routine method.

Learning outcomes

On completion of the course, students are able to:

1. describe all the advanced histological techniques ;
2. explain the principles of these techniques ;
3. explain detailed explanation on the steps and procedures in each technique ;
4. discuss the circumstances that will necessitate the application of these techniques ;
5. list 10 equipment used in advanced histopathological techniques ;
6. explain detailed explanation of how the equipment used works ; and
7. Compare advantages and disadvantages of adopting these techniques in hospital and research laboratories.

Course content

Immunohistochemistry- Definition. Methods. production of primary reagents; polyclonal and monoclonal antibodies. Antigens Antibody dilution . incubation and titer. Damasking of antigens – methods of antibody retrieval- heat. Chemical and Proteolytic enzymes. Label in IHC radio labels. tissue preparation and cover slipping. Enhancement and amplification of antigens. IHC staining procedure e,g Avidin biotin method. Reporting and scoring in immunohistochemistry. Immunocytochemistry. Resin embedding, Enzyme histochemistry. insitu hybridization and tissue micro array. Principles and use of fluorescent microscope. Dark field microscope, Confocal microscope. Stereomicroscope. polarizing microscope. and super resolution microscope. Ultramicrotomy. Cryostat. micro-incineration. Preparation of stained smears and specimen for photomicroscopy and macrophotography respectively. Electron Microscopy-preparation of materials. embedding reagents. microtomy and staining. Toxicity of some reagents used in Electron Microscopy. cytocentrifuge. automation in histopathology. Histometry and image analysis. Quality assurance and quality control in histopathology. safety in histopathology laboratory.

NDU –MLS 552 . DIAGNOSTIC CYTOLOGY (2 Units; C; LH 15; PH 45)

Senate Approved Relevance

Cytology is an indispensable instrument for the prevention, diagnosis, monitoring, and treatment of diseases, particularly malignant conditions. A lack of organized, systematic, population-based cancer screening programmes is evidenced by the increased prevalence of cancer within the Nigerian population and Bayelsa State in particular, as well as the obvious manpower demand.

Creating a groundwork that responds to societal needs is crucial. Medical laboratory science graduates will all benefit greatly from taking this course. Those who took histopathology and cytology in their last year of school would have been better prepared to meet clients' expectations for competent service delivery in this setting and to compete internationally. The World Health Organization (WHO) has long recognized and advocated cervical cytology (Pap screening) as the first line of cancer of the uterine cervix prevention and diagnosis.

Overview

Cytology is the study of cells at the microscopic, ultrastructural, and molecular levels. It is utilised in the screening and early detection of cancer, the diagnosis of cancer and other diseases, such as infections and benign disorders, the monitoring of treatment, and the provision of scientific data to support clinical treatment decisions. It is applicable to both clinical and veterinary medicine.

The cytological examination entails meticulous, appropriate specimen collection from the correct anatomical site, prompt preservation with an appropriate fixing agent, laboratory processing to produce a diagnostic slide, and microscopic examination of the cellular features on the slide while correlating findings with clinical, radiological, and other laboratory findings. The cells under study may be lost spontaneously from body surfaces (exfoliative cytology), scraped from body surfaces (abrasive cytology), or extracted with a needle and syringe from a body site (aspiration cytology).

Objectives

The objectives of this course is enable students to:

1. describe normal cellular and non-cellular constituents in smear ;
2. discuss cellular changes consistent with inflammation and tissue repair ;
3. Identify infectious agents that may be found in smears ;
4. describe and diagnose various benign conditions within the ambits of cytodiagnosis ;
5. describe premalignant lesions and malignant conditions in smears ;
6. state cytomorphologic criteria to diagnose various squamous and glandular malignancies, mesothelioma, lymphoma, and sarcomas ;
7. evaluate smears for cellular adequacy ; and
8. describe different system in diagnostic cytology .

Learning outcomes

At the end of the course students are able to :

1. describe normal cellular and non-cellular constituents in smear ;
2. discuss cellular changes consistent with inflammation and tissue repair ;
3. Identify infectious agents that may be found in smears ;

4. describe and diagnose various benign conditions within the ambits of cytodiagnosis ;

5. describe premalignant lesions and malignant conditions in smears ;

6. state cytomorphologic criteria to diagnose various squamous and glandular malignancies, mesothelioma, lymphoma, and sarcomas ;

7. evaluate smears for cellular adequacy ; and

8. describe different system in diagnostic cytology.

Course content

The Normal Pap smear, adequacy criteria of both conventional and liquid-based smears. Normal squamous cells constituents. Normal glandular constituents. Metapalastic cells and metaplasia. Smear patterns. Squamous cell abnormalities – ASCUS. LSIL. ASC-H. HSIL and squamous cell carcinoma. Glandular cell abnormalities- ADC, AIS and other malignant conditions. Benign cytological mimics of malignancy. Radiation changes. inflammation and Repair. Non-neoplastic findings – organism and contaminants. The Bethesda System of Reporting Cervical cytology. Histopathologic-Cytologic correlation of gynaecologic lesions and malignancies. Slide reading and reporting alongside practical sessions. Correlate in clinical and radiological findings with cytomorphological features Review of specimen processing techniques for various non-gynaecologic samples. specimen collection techniques. Evaluation of cellular adequacy in Rapid Onsite (ROSE) collected smears. Diagnostic criteria in urine cytology. The Paris System. Features of mesothelial cells on Pap stained smears and Romanowsky stained slides. Principle of Exfoliative cytology. cells in effusion cytology. Benign and Malignant features in effusions cytology. CSF-Production, benign and malignant features. Pleocytosis in CSF cytology. and gastric brushings/ washings. Features of normal. benign. malignant and infectious agents. cytopathic effects in respiratory tract cytology and body fluids. Fine needle Aspiration Cytology of Breast. Salivary gland. Thyroid. Lymph node. Pancreas. and soft tissues and their cytomorphological features. Slide reporting conventions for various aspiration cytology specimens. Slide Reading and Reporting along with practical

NDU –MLS 553 CYTOGENETICS (2 Units; C LH 15; PH 45)

Senate approved relevance

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with NDU 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:

Human genetics is the scientific study of genes and hereditary. It illustrates how certain qualities or traits are passed from parents to offspring as a result of changes in DNA sequence while

Cytogenetics involves testing samples of tissue, blood, or bone marrow in a laboratory to look for changes in chromosomes which may lead to abnormality.

The aim of studying Human genetics and cytogenetics by students of Medical Laboratory Science is to educate them on detection of chromosomal abnormalities associated with diseases, as well as the characterization of new alterations that allow more research and increase knowledge about the genetic aspects of these diseases in a population.

Learning objectives

The objective is to enable students to

1. explain the practice of cytogenetics and its applications in haematology and blood group serology
2. state Hardy Weinberg equation to explain population genetics
3. describe pedigree analysis and its role in understanding inheritance
4. explain inheritance using the laws of segregation and independent assortment
5. discuss the factors that result in gene variation
6. describe DNA and its role in inheritance, mutations and resulting disorders
7. describe methods for cytogenetic analysis and chromosome identification
8. demonstrate chromosomal abnormalities.

Learning outcome

At the end of the course, students are able to:

1. explain the practice of cytogenetics and its applications in haematology and blood group serology
2. state Hardy Weinberg equation to explain population genetics
3. describe 10 pedigree analysis and its role in understanding inheritance
4. explain inheritance using the laws of segregation and independent assortment
5. discuss 10 factors that result in gene variation
6. describe DNA and its role in inheritance, mutations and resulting disorders
7. describe 5 methods for cytogenetic analysis and chromosome identification
8. demonstrate 10 chromosomal abnormalities

COURSE CONTENTS

Terminology. theory and practice of clinical cytogenetics. Applications of cytogenetics in histopathology. Levels of genetic organization: genes and individual, families, population, evolution. Hardy Weinberg equilibrium. Allelism, dominant and recessive inheritance. pedigree analysis. Segregation and independent assortment. linkage and association. Gene variation and interaction. Selection. genetic drift and inbreeding. Chromosomes Analysis. Structure . Organization and Staining Techniques. Chromosomes in Man. Normal Karyotype and

Chromosomonal Abnormalities. Mosiacism, Trisomy, Monosomy, Translocation, Klinefelter's and Turner's Syndromes; Sex Chromatin, Inactivation of X-chromosomes and sex determination. Genetic diseases. Mutation and mutagens. Sex chromosome. sex-linked and sex-influenced traits. Mosaicism & chimerism. Methods of cytogenetic analysis, including staining. Understanding the basic chromosome identification and karyotype construction, Clones, Mapping of Autosomes Philadelphia and Christ Church Chromosomes. Paternity testing. Molecular cytogenetic techniques including Polymerase Chain Reaction. DNA Extraction Methods, Blotting Techniques . Slide reporting

NDU –MLS 554 Forensic Pathology (2 Units; C; LH 15, PH 45)

Senate Approved Relevance

The philosophy of this course, in line with the vision of the University, is to produce graduates who have the knowledge and skill to contribute to the welfare of the society, fight crime and enhance the medico-legal system. This course is important because it provides opportunity for graduates of Medical Laboratory Science to investigate crime, arson, and death, using their professional knowledge and skills.

Overview:

Forensic pathology is a unique branch of medicine that involves determination of cause of death by post-mortem examination of human remains and examination of the living for toxins and poisons. Post-mortem examination, also called autopsy is applied in various scenarios such as in determining cause of death especially in unnatural or suspicious circumstances, in solving criminal cases and identification of victim remains in cases of mass disasters amongst others.

Forensic investigations are also necessary for tracing of ancestral and familial lineage, examinations of victims of rape or abuse and diagnosis of victims of poisoning. From these, it is quite evident that forensic pathology is a broad and wide encompassing field of medicine, hence this course will provide students with all the information and knowledge needed in laboratory investigations involving the above circumstances.

Objectives

The objectives is to enable students to :

1. describe what forensic pathology entails
2. discuss the history of forensic pathology
3. state the principle of DNA analysis and fingerprinting
4. describe the samples to be collected for a forensic examination
5. describe the process of forensic analysis in the living
6. describe the process of postmortem examination
7. discuss forensic entomology
8. explain the scenarios that necessitate the application of forensic techniques
9. e xplain forensic toxicology and poisons

Learning outcomes

On completion of the course, students are able to:

1. describe what forensic pathology entails
2. discuss the history of forensic pathology
3. state the principle of DNA analysis and fingerprinting
4. describe the samples to be collected for a forensic examination
5. describe the process of forensic analysis in the living
6. describe the process of postmortem examination
7. discuss forensic entomology
8. explain the scenarios that necessitate the application of forensic techniques
9. explain forensic toxicology and poisons

Course content

Definition of Forensic Science. Branches of Forensic Science. History. Principles and Applications of Forensic science. Practice and applications of forensic science. Crime scene management and forensic exhibit. Jurisprudence and forensic science. Collection of materials/samples of forensic interest. Types, mechanisms and causes of death. Signs of death and what to do with a dead body. Changes after death. The time of death. Identification of live dead human remains. Postmortem chemistry. Type of injuries. Poisons. classification of poisons. Investigation of a poisoning case. Extraction of poisons from tissues. Biochemical analysis in forensic. including modern instrumentation techniques. Identification of saliva. sex offences. blood stain and groupings. paternity briefs e.t.c. Arson. Crime-scene Investigation and Evidence Collection. Fingerprints. Forensic Entomology. Fundamentals of forensic anthropology of trace and Contact Elements such as Fingerprints, Footprints. Hairs. Fibre and Other Marks and Impressions. of trace and Contact Elements such as Fingerprints. Footprints. Hairs. Fibre and Other Marks and Impressions. Embalment techniques and demonstrations. Mortuary organization and management

Minimum Academic Standards

In line with the NUC-MAS requirement facilities.

NDU –MLS 555 Systemic Pathology/histology of organs (2 Units; LH 15, PH 45)

Senate approved relevance

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with NDU 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:

Systemic Pathology is aimed at bridging the gap between science and medicine. It intends to educate students of Medical Laboratory Science to understand the study of disease of the various

organs and systems of the human body. It underpins every aspect of patient care, from diagnostic testing and treatment advice to using cutting-edge genetic technologies and preventing disease.

Systemic pathology enables students of Medical Laboratory Science acquire knowledge and skills on detection of potential to develop a disease, diagnosis of disease conditions, identification of cause or severity of disease as well as monitoring disease progression.

Objectives

This course objectives is to enable students to:

1. describe understand basic systemic diseases
2. state the pathogenesis of these systemic diseases
3. describe the molecular basis of the diseases
4. discuss the risk factors and prevention of these diseases
5. state the various differential diagnostic methods for the diseases
6. describe the various histological changes in diseases microscopically.

Learning outcomes

On completion of the course, students are able to:

1. describe understand basic systemic diseases
2. state the pathogenesis of systemic diseases
3. describe the molecular basis of the diseases
4. discuss the risk factors and prevention of these diseases
5. state the various differential diagnostic methods for the diseases
6. describe the various histological changes in diseases microscopically.

Course contents

Heart: Hypertensive heart-disease. heart failure and cardiomyopathies. Respiratory: Tuberculosis. Pneumonia. Renal: Nephropathy associated with infestations and infections, Glomerulonephritis. Lymphoreticular: Malignant lymhomas (Non-Hodgkins and Hodgkins lymphoma, Burkitts). GIT Tract: cancers of the mouth. Oesophagus. intestines and stomach; Liver: Hepatitis. Cirrhosis, primary liver cell carcinoma. Female Reproductive Organs. Pelvic inflammatory disease. Cancers – cervical. trophoblastic. ovarian. Skin: Leprosy. Kaposis sarcoma. Nutritional disorders. Slide reporting. Review of histology of the following organs Cardiovascular. Respiratory. Gastrointestinal. Urogenital. reproductive system histology. Neuro-histology-brain and the spinal cord. - endocrine glands pituitary. Thyroid. Pancreas. Adrenal. ovary and testis. Skin

NDU-MLS 556- Final Professional Examination (3 Units C: LH15 -; PH 60)

Senate approved relevance

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with NDU 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 an evidence of specialized psychomotor experience acquired within the first four years of training through the demonstration of basic laboratory tests in histopathology and cytology

Objectives

The objectives of this course to enable students to:

1. demonstrate tissue parasites and microorganism
2. demonstrate immunohistochemical technique
3. demonstrate microtomy and section picking of tissue sections
4. demonstrate recticulin fibres in tissue
5. demonstrate general tissue using conventional and rapid method
6. demonstrate cytological smears
7. identify features of tissues
8. demonstrate connective tissue elements in tissues

Learning Outcomes

At the end of the course the student are able to:

1. carry out 5 tissue parasites and microorganism staining using special stains
2. carry out 5 immunohistochemical technique using specific antibodies
3. carry out microtomy and floating of tissue sections
4. carry out 5 recticulin fibres staining in different tissue
5. carry out general tissue demonstration using conventional and rapid method
6. carry out 20 identification visceral organ tissue
7. carry out 20 cytological smears preparation and staining using different stains
8. carry out 5 demonstration of connective tissues elements in tissue sections.

Course content

This is a buildup 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).

Final Professional Examination

This is a buildup 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)

500 LEVEL (HAEMATOLOGY AND BLOOD TRANSFUSION SCIENCE)

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

Learning Outcomes

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

1. show or demonstrate competency in independent running of a medical laboratory as a full fledge professional;
2. display right administrative acumen in the running of a medical laboratory facility; and
3. impart the right knowledge and professional know how to upcoming students and scientists.

Course

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

MLS 503: Practical Exercises II (2 Units C: PH 45)

Each student carries out practical based on the area of major specialty.

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

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

Learning Outcomes

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

1. explain laboratory procedures including safety precautions;
2. carry out independent researches that will lead to tangible outcomes; and
3. present outcome of their researches in seminars and conferences.

Course Contents

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

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

Learning Outcomes

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

1. identify a topic of current interest in any branch of medical laboratory science;
2. search for the appropriate literature in the chosen topic; and
3. prepare and disseminate the knowledge using the appropriate format within a time frame.

Course Contents

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

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

Learning Outcomes

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

1. conduct advanced haematological procedures;
2. discuss the disorders of Iron metabolism; and
3. describe the different automation in Haematology.

Course Contents

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

NDU-MLS 561- Immunohaematology (2 units; C; LH15 PH45)

Senate-approved relevance.

To produce graduates who are skilled and proficient in the practice of blood collection in health care facilities in line with the vision of the University in excellence and creativity.

Overview

Immunohematology is a specialized branch of laboratory medicine. It involves the study of the theory and practice of a wide variety of procedures used in the following: donor selection, component preparation and use, and techniques used to detect antigen/antibody reactions which may adversely affect a patient receiving a transfusion.

The topics to be covered include: donor screening, preparation of components, antigens/antibodies of the ABO, Rh and other blood group systems, pre-transfusion testing procedures, hemolytic disease of the newborn, neonatal and obstetrical transfusion practice, autoimmune hemolytic anemias and adverse effects of transfusion

Objectives: The objectives of this course is to enable students to;

1. state principles of safety, quality assurance, and quality control in immunohematology;
2. describe blood group genetics, characteristics of main blood group systems, and the principles of Immunology, as they relate to Immunohematology;
3. describe proficiency and accuracy in antibody screening and identification, compatibility testing, and corresponding component selection;
4. differentiate immediate from delayed transfusion reactions; list and perform mandatory procedures following the reporting of a transfusion reaction; and
5. discuss plans for evaluation of pre-natal, maternal, and cord blood testing to assist in diagnosis of Hemolytic Disease of the fetus/newborn
6. explain haemolytic disease of the new born
7. describe the important of blood transfusion in neonatal and obstetrics

Learning Outcomes:

At the end of this course, the student are able ;

1. state principles of safety, quality assurance, and quality control in immunohematology;
2. describe blood group genetics, characteristics of main blood group systems, and the principles of Immunology, as they relate to Immunohematology;
3. describe proficiency and accuracy in antibody screening and identification, compatibility testing, and corresponding component selection;
4. differentiate immediate from delayed transfusion reactions; list and perform mandatory procedures following the reporting of a transfusion reaction; and
5. discuss plans for evaluation of pre-natal, maternal, and cord blood testing to assist in diagnosis of Hemolytic Disease of the fetus/newborn
6. explain haemolytic disease of the new born
7. describe the important of blood transfusion in neonatal and obstetrics

Course Contents

Genetics of blood group inheritance. Quality Assurance in the Immunohematology Laboratory. Immune Process and Genetics. Antigen-antibody Reactions. Anti-Human Globulin. and Enhancers. ABO system and Discrepancy. Lewis System and Rh System. Other Systems. Antibody Screen and Identification. Pre-transfusion and compatibility testing. Transfusion Reactions. Donor testing. Hemolytic Disease of the Newborn. Quality control. HLA, Autoimmune Hemolytic Anaemia**.** Safe blood Africa. Counseling of blood donors. Management of risk associated with transfusion. Medicolegal issues in blood transfusion

NDU-MLS 562: Blood Group Serology 11 (2 units; C; LH15 PH 45)

Senate-approved relevance

To produce graduates that are skilled, competent, and proficient in the operation of blood bank, maintenance of blood bank records, blood storage, reliable administration of ethical issues & laws governing blood donation and transfusion practice in line with the vision of the University, portraying excellence and creativity.

Overview

Blood Group Serology 11 fortifies student with specialized skills and ability to operation blood banks, maintain reliable blood bank records, carryout blood storage, and manage ethical issues professionally as well as effectively following the laws governing blood donation and transfusion practice. The practice of National blood transfusion service, preparation of commercial quantities of polyclonal antisera, and production of monoclonal antibodies are well considered,

Topics to be covered include: operation of blood bank, maintenance of blood bank records, blood storage. ethical issues & laws governing blood donation and transfusion practice. leucocyte and platelet antigens and antibodies,National Blood Transfusion Service (NBTS). preparation of commercial quantities of polyclonal antisera. principles, uses and techniques (hybridoma technique) of producing monoclonal antibodies, blood donation (types and forms), alternatives to blood donation (autologous blood donation, preoperative autologous donation, acute normovolaemichaemodilution,intraoperative blood salvage [cell salvage] and post-operative blood salvage). Blood substitutes (haemoglobin based oxygen carriers, perfluorocarbons, blood volume expanders, pharmaceutical agents: aprotinin, tissue sealants, tranexamic acid, dessmopressin); WHO standards in BGS and Blood Banking. Quality assurance/control in blood group serology and blood banking.

Objectives: The objectives of this course is to enable students to

1. discuss key areas of the operation of blood bank;
2. explain vital aspects of effective maintenance of blood bank records;
3. Identify key components for proper blood storage;
4. discuss a comprehensive guide on ethical issues & laws governing blood donation and transfusion practice..
5. describe skills to adequately analyze leucocyte and platelet antigens and antibodies.
6. explain the principles and practices of National Blood Transfusion Service (NBTS);
7. state how to preparepolyclonal antisera in commercial quantities;
8. state principles, uses and techniques (hybridoma technique) of producing monoclonal antibodies;
9. discuss various types and forms of blood donation, including alternatives to blood donation (autologous blood donation, preoperative autologous donation, acute

normovolaemic haemodilution, intraoperative blood salvage [cell salvage] and post-operative blood salvage);

10. explain blood substitutes (haemoglobin based oxygen carriers, perfluorocarbons, blood volume expanders, pharmaceutical agents: aprotinin, tissue sealants, tranexamic acid, dessmopressin), and understand their applications;
11. state WHO standards in Blood Group Serology and Blood Banking;
12. explain Quality Assurance/Control procedures in blood group serology and blood banking;

Learning Outcomes:

At the end of this course, the students are able to;

1. discuss key areas of the operation of blood bank;
2. explain vital aspects of effective maintenance of blood bank records;
3. Identify key components for proper blood storage;
4. discuss a comprehensive guide on ethical issues & laws governing blood donation and transfusion practice..
5. describe skills to adequately analyze leucocyte and platelet antigens and antibodies.
6. explain the principles and practices of National Blood Transfusion Service (NBTS);
7. state how to preparepolyclonal antisera in commercial quantities;
8. state principles, uses and techniques (hybridoma technique) of producing monoclonal antibodies;
9. discuss various types and forms of blood donation,
10. explain blood substitutes (haemoglobin based oxygen carriers, perfluorocarbons, blood volume expanders, pharmaceutical agents: aprotinin, tissue sealants, tranexamic acid, dessmopressin), and understand their applications;
11. state WHO standards in Blood Group Serology and Blood Banking;
12. explain Quality Assurance/Control procedures in blood group serology and blood banking;

Course Contents

Operation of blood bank. maintenance of blood bank records. blood storage. ethical issues & laws governing blood donation and transfusion practice. leucocyte and platelet antigens and antibodies. National Blood Transfusion Service (NBTS). preparation of commercial quantities of polyclonal antisera. principles, uses and techniques (hybridoma technique) of producing monoclonal antibodies. blood donation (types and forms). alternatives to blood donation (autologous blood donation. preoperative autologous donation. acute normovolaemic haemodilution. intraoperative blood salvage [cell salvage]. post-operative blood salvage). Blood substitutes (haemoglobin based oxygen carriers, perfluorocarbons, blood volume expanders. pharmaceutical agents: aprotinin. tissue sealants. tranexamic acid. dessmopressin); WHO

standards in BGS and Blood Banking. Quality assurance/control in blood group serology and blood banking. Importance of demographic information in blood bank.

NDU-MLS 563: Haemostasis (2 units; C; LH 15; PH 45)

Senate approved relevance

The vision of the University is to produce graduates who are competent and skilled in their areas of endeavour. This course Haemostasis is in line with this vision by producing qualified and skilled manpower that can render professional services in haemostasis in the healthcare industry.

Overview

The term 'haemostasis' refers to the normal response of the vessel to injury by forming a clot that serves to limit haemorrhage. Thrombosis is pathological clot formation that results when haemostasis is excessively activated in the absence of bleeding. Under normal physiological conditions there is a delicate equilibrium between the pathological states of hypercoagulability and hypocoagulability in the circulating blood.

Both inherited and acquired disorders can result in either bleeding or thrombosis. This course provides an overview of theory and practical application of hemostasis (coagulation), as it relates to the medical laboratory practice andpresents coagulation laboratory principles and correlates results with disease states.

Objectives; The objectives of the course to enable students to ;

1. explain the importance of effective haemostasis;
2. list the major components of haemostatic mechanisms;
3. describe the mechanisms of primary haemostasis;
4. describe the mechanisms of secondary mechanisms
5. describe the mechanisms of fibrinolysis;
6. outline the interplay between the elements of haemostasis;
7. describe the disorders of haemostasis, and
8. describe the various tests employed in the diagnosis and monitoring of haemostatic disorders.

Learning Outcomes

At the end of the course the students are able to :

1. explain the importance of effective haemostasis;
2. list the major components of haemostatic mechanisms;
3. describe the mechanisms of primary haemostasis;
4. describe the mechanisms of secondary mechanisms
5. describe the mechanisms of fibrinolysis;
6. outline the interplay between the elements of haemostasis;
7. describe the disorders of haemostasis, and

8. describe the various tests employed in the diagnosis and monitoring of haemostatic disorders.

Course contents

Definition of Hemostasis. Platelet structure. platelet physiology and function. Intrinsic and extrinsic coagulation pathways. Terminology and factors involved in the coagulation process. Process and substances influencing thrombosis, fibrinolysis and coagulation inhibition. Modes of action and therapeutic use of anticoagulants. Coagulation disorders. Platelet function disorders. Clotting factor disorders. DIC. Laboratory, thrombin time. fibrinogen levels, factor XIII assays, FDPs, D-dimer, mixing studies, heparin assay and platelet function assay. Coagulation automation testing Skills. Instrumentation in coagulation studies .

NDU-MLS 564 Cytogenetics (2 Units; C; LH 15; PH 45)

Senate Approved Relevance

Using cytogenetic procedures, chromosomal abnormalities are best explored. This method is used to diagnose cancer and hereditary illnesses, as structural and numerical deviations are easily interpreted by karyotyping. Infertility and prenatal diagnosis are additional areas of applicability for cytogenetics. In accordance with the philosophy of the university, this course would generate graduates capable of performing this role. Cytogenetic practise is abysmally low within the country, and there is a significant need for individuals with these talents worldwide, particularly in the United States of America. Cytogenetics links gene annotation and molecular biology advancements.

Overview

Cytogenetics is the study of chromosomes, which include lengthy strands of DNA and proteins that contain the majority of a cell's genetic information. Changes in the structure and number of chromosomes may result in disease states or inadequate physiological performance of affected organs, such as mental retardation or growth anomalies.

Cytogenetics is subcategorized into molecular cytogenetics, clinical cytogenetics, and cancer cytogenetics. The fast development of genomic, epigenetic, interactomic, proteomic, and a multitude of other 'omic' technologies has created opportunities for the advancement of cytogenetics. The synergy required to decipher the molecular aetiology of diseases resides in the combination of many methods. "Precision or individualised medical care for each patient" is the prevalent healthcare mantra. Cytogenetics is essential to precision oncology.

Objectives

The objectives of the course is to enable students to:

1. describe the structure of the human chromosome and ISCN cytogenomic nomenclature

2. discuss structural abnormalities in chromosomesand their associated diseases
3. discuss numerical abnormalities in chromosomes and their associated diseases
4. explain genetic material flow and interactions
5. describe the cell cycle and its relation to oncogenesis
6. explain genetic, biochemical, and gonadalsex-determining factors in embryological development
7. describe sex chromosomes and sex-linked disorders
8. explain population genetics, pedigree analysis, and the Hardy-Weinberg equation
9. discuss the procedure for karyotyping and techniques used to prepare a karyotype
10. explain cytogenetics of haematological neoplasms
11. discuss cytogenetics of solid tumours, genomic imprinting, and uniparental disomy
12. explain how various samples are used for cytogenetic analysis in the laboratory

Learning Outcomes

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

1.describe the structure of the human chromosome and ISCN cytogenomic nomenclature
2. discuss structural abnormalities in chromosomesand their associated diseases
3. discuss numerical abnormalities in chromosomes and their associated diseases
4. explain genetic material flow and interactions
5. describe the cell cycle and its relation to oncogenesis
6. explain genetic, biochemical, and gonadalsex-determining factors in embryological development
7. describe sex chromosomes and sex-linked disorders
8. explain population genetics, pedigree analysis, and the Hardy-Weinberg equation
9. discuss the procedure for karyotyping and techniques used to prepare a karyotype
10. explain cytogenetics of haematological neoplasms
11. discuss cytogenetics of solid tumours, genomic imprinting, and uniparental disomy
12. explain how various samples are used for cytogenetic analysis in the laboratory

Course Contents

History and definition of cytogenetics. ISCN cytogenomic nomenclature. Chromosome structure, organization, staining, and analysis techniques. Numerical and structural chromosomal abnormalities, sex chromosomes, sex chromosome abnormalities, genetic diseases, and consanguinity. Clones and gene mapping of autosomes. Genetic material, flow and interactions. X-linked inheritance. Chimera. Population genetics. Pedigree analysis. Hardy-Weinberg equation. Cytogenetics of infertility. Prenatal cytogenetics. Cytogenetics of solid tumours. Cytogenetics of haematological neoplasms. Genomic imprinting and uniparental disomy. Chromosome instability. Instrumentation in the cytogenetics laboratory. Quality management system in the clinical cytogenetics laboratory. Genetic counseling.

NDU-MLS 565: Blood Group Serology III (2 Units; C; LH15, PH 45)

Senate Approved Relevance

Th philosophy of Blood Group Serology III which is in line with the vision of the University, is to produced graduates with skills required to carry out automated testing and mount automated devices in a blood bank, aimed at enhancing blood banking services in health facilities in Rivers State.

Overview

Blood Group Serology III instills knowledge of working principles and skills inusing automated devices to carry out tests in blood group serology and operate an efficient blood banking system geared toward timely and accurate delivering of blood banking services.

The contents of Blood Group Serology III include advanced automated techniques the Haematologist/Blood Transfusion Scientist will adopt to quick delivery of blood banking services without compromising standards. The scope covers automation in sample collection and identification, disease testing and blood group identification, automation in blood component separation, automation in crossmatching.

Objectives

The objectives of the course is to enable students to:

1. state the principles of the various automated devices;
2. describe the working principles to carry out blood group serology tests and blood banking services;
3. explain different types of immunohaematology platforms;
4. list the various types of automated blood grouping techniques;
5. explain automated devices in collection of blood;
6. describe the apheresis machine to separate whole blood into its components;
7. describe washing and drying pipettes using the pipette washer and dryer, and
8. discuss automation in running blood banking services for quick delivery of blood products without compromising results.

Learning Outcomes

At the end of this course, students are able to:

1. state the principles of the various automated devices;
2. describe the working principles to carry out blood group serology tests and blood banking services;
3. explain different types of immunohaematology platforms;
4. list the various types of automated blood grouping techniques;
5. explain automated devices in collection of blood;
6. describe the apheresis machine to separate whole blood into its components;
7. describe washing and drying pipettes using the pipette washer and dryer, and

8. discuss automation in running blood banking services for quick delivery of blood products without compromising results.

Course Contents

Techniques for emergency compatibility testing – low ionicsalt solution (LISS),spin coomb's albumin. Special compatibility techniques. Exchange and Extracoporeal blood transfusion. Preparation of enzymes used in blood group serology (bromelin, trypsin, ficin and papain). Forensic applications of blood group serology. Two-stage Coomb's test. Automation in blood group serology to cover immunohaematological platforms such as BIORAD, DIAGAST, Ortho-clinical diagnostics. Immucor, Griffol. Techniques in blood group serology such ascolumn agglutination techniques,solid phase red cell adherence assay. erythromagnetictechnology. Automation in blood component separation/processing. Traceability of blood products using barcoding and radio frequency identification number (RFID). Automation in Testing. Electronic Cross matching. DNA blood typing. Necleicacid amplification. Auto analysers for antibodies and antigen detection and identification. Automation in phlebotomy. Pipette washers and dryers (e.g. The ScrubAir^{TM} Pipette Washer/Dryer).

NDU-MLS-567 Final Professional Examination (3 Units C: LH -15; PH 60)

Senate approved relevance

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with NDU 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 an evidence of specialized psychomotor experience acquired within the first four years of training through the demonstration of basic laboratory tests in haematology,

Objectives

The objectives of this course is to enable students to:

1. demonstrate specialized laboratory tests in blood film
2. demonstrate specialized laboratory tests in compatibility testing
3. demonstrate specialized laboratory tests in full blood count
4. demonstrate specialized laboratory tests in erythrocytes sedimentation
5. demonstrate specialized laboratory tests in prothrombin time
6. demonstrate specialized laboratory tests in ABO blood grouping
7. demonstrate specialized laboratory test direct coomb test
8. demonstrate specialized laboratory tests indirect Coomb

Learning Outcomes

At the end of the course , the students are able to:

1. carry out 20 specialized laboratory tests in blood film
2. carry out 5 specialized laboratory tests in compatibility testing
3. carry out 10 specialized laboratory tests in full blood count
4. carry out 10 specialized laboratory tests in erythrocytes sedimentation
5. carry out 5 specialized laboratory tests in prothrombin time
6. carry out 10 specialized laboratory tests in ABO blood grouping
7. carry out specialized laboratory test in direct coomb test
8. carry out specialized laboratory tests in indirect Coomb

Course content

This is a buildup 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).

500 Level (MEDICAL MICROBIOLOGY)

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

Learning Outcomes

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

1. show or demonstrate competency in independent running of a medical laboratory as a full fledge professional;
2. display right administrative acumen in the running of a medical laboratory facility; and
3. impart the right knowledge and professional know how to upcoming students and scientists.

Course

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

MLS 503: Practical Exercises II (2 Units C: PH 45)

Each student carries out practical based on the area of major specialty.

Medical Microbiology and Parasitology

Examination, culture and identification of bacteria in CSF pleural, ascitic fluid. Blood culture, High vaginal swab, wound swabs, ear, eye, nasal and other swabs. Stool bacteriology. Sputum

bacteriology, Urine bacteriology. Systemic fungal culture and identification. Semen analysis. Special serological tests. ASO Widal, VDRL, rheumatoid factor, Complement fixation, neutralization, haemagglutination tests for identification of viruses. General identification of micro-organisms by animal inoculation. Biochemical tests for the identification of vibrio cholera, Shigella, Candida, Neisseria.

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

Learning Outcomes

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

1. explain laboratory procedures including safety precautions;
2. carry out independent researches that will lead to tangible outcomes; and
3. present outcome of their researches in seminars and conferences.

Course Contents

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

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

Learning Outcomes

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

1. identify a topic of current interest in any branch of medical laboratory science;
2. search for the appropriate literature in the chosen topic; and
3. prepare and disseminate the knowledge using the appropriate format within a time frame.

Course Contents

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

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

Learning Outcomes

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

1. discuss basic concepts of methods for the diagnosis of fungal infections; and

2. discuss basic concepts of methods for the diagnosis of viral infections.

Course Contents

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

NDU –MLS 571 Molecular diagnostics II and Bioinformatics (2 Units; C; LH 15; PH 45)

Senate approved relevance

The vision of the university is to produce graduates who are competent and skilled in their areas of endeavour. This course Molecular diagnostics II and Bioinformatics is in line with this vision by producing qualified and skilled manpower that can render professional services in Molecular diagnostics II and Bioinformatics in the healthcare industry.

Overview

Bioinformatics is the science of storing, extracting, organizing, analyzing, interpreting and using information. The approaches to the discipline of bioinformatics incorporate expertise from the biological sciences, computer science and mathematics.

The inclusion of bioinformatics in the curriculum is designed to stimulate the interest of students in molecular biology and genetics. The course will enable students to be involved in the analysis of the human genome, identification of targets for drug discovery, development of new algorithms and analysis methods, the study of structural and functional relationships, and molecular evolution.

Objectives

The objectives of the course is to enable students to:

1. discuss the basic concepts of Bioinformatics and its significance in Biological data analysis;
2. explain advanced techniques in molecular biology and applications;
3. discuss Sequencing technologies;
4. discuss data mining and storage, Phylogeny, Sequence editing and alignment, BLAST, gene mapping, open reading frames and consensus sequences; and

5. explain Omic sciences.
6. describe the basic concepts of polymerase chain reaction
7. describe the basic concepts of sequencing technologies
8. explain navigation, mining and storage of biological data in selected data bases, and
9. discuss the basic concepts and uses of some bioinformatics/computational biology tools

Learning outcome

At the end of the course students are able to:

1. discuss the basic concepts of Bioinformatics and its significance in Biological data analysis;
2. explain advanced techniques in molecular biology and applications;
3. discuss Sequencing technologies;
4. discuss data mining and storage, Phylogeny, Sequence editing and alignment, BLAST, gene mapping, open reading frames and consensus sequences; and
5. explain Omic sciences.
6. describe the basic concepts of polymerase chain reaction
7. describe the basic concepts of sequencing technologies
8. explain navigation, mining and storage of biological data in selected data bases, and
9. discuss the basic concepts and uses of some bioinformatics/computational biology tools

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, 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.

NDU -MLS 572- THERAPEUTIC AND ANTIBIOTICS AGENTS (2 Credit Units; C: 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 NDU 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

Therapeutic and antibiotics agents course will provide a more specialized training to students to handle sophisticated equipement using appropriate methods in Medical Laboratory microbiology and parasitology for the diagnosis of diseases and reasearch.

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

Learning objectives

The objectives of the Course is to enable students to:

1. explain the role of microorganisms in the production of pharmaceuticals.
2. discuss how to classify antibiotics and their modes of action.
3. explain the mechanisms of bacterial resistance to antimicrobials.
4. explain how to prepare and standardize of bacterial antigens.
5. explain how to prepare antibiotic discs.
6. describe microbial infections and treatment using laboratory animals.
7. describe quality assurance in pharmaceutical products.

Learning outcome

At the end of this course, the students are able to:

1. explain the role of microorganisms in the production of pharmaceuticals.
2. classify antibiotics and their modes of action.
3. explain the mechanisms of bacterial resistance to antimicrobials.
4. explain how to prepare and standardize of bacterial antigens.
5. explain how to prepare antibiotic discs.
6. describe microbial infections and treatment using laboratory animals.
7. describe quality assurance in pharmaceutical products.

Course contents

Introduction to Pharmaceutical Microbiology. Discovery and history of antibiotics. Principles of antibiotics and chemotherapeutics. Classification and modes of action of antibiotics. Mechanisms of bacterial resistance to antibiotics. Methods of Antimicrobial sensitivity testing. Minimum inhibitory and minimum bactericidal concentrations of antibiotics. Antibiotic assays. Preparation of antibiogram discs. Preparation and standardization of bacterial antigens and immune sera. Microorganisms of pharmaceutical interest. Quality assurance of pharmaceutical products. Use of animal models in the study of microbial infections and treatment. Drug interaction , commonly use antibiotics, Fight against antibiotic resistance.

NDU-MLS 573 PUBLIC HEALTH MICROBIOLOGY (2 Credit Units; C: 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 NDU 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

Public health Medical Microbiology will provide a more specialized training to students to handle sophisticated equipement using appropriate methods in Medical Laboratory microbiology and parasitology for the diagnosis of diseases and reasearch.

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

Learning objectives

The objectives of the Course is to enable students to:

1. explain an overview of Public Health Microbiology
2. discuss the general principles of microbial disease transmission
3. differentiate the types of public health interventions
4. state basic techniques for water treatment and waste water disposal
5. describe the basic techniques for water treatment and waste water disposal

Learning outcome

At the end of this course, the students are able to:

1. explain an overview of Public Health Microbiology
2. discuss the general principles of microbial disease transmission
3. differentiate the types of public health interventions
4. state basic techniques for water treatment and waste water disposal
5. describe the basic techniques for water treatment and waste water disposal

Course contents

Overview of Public Health Microbiology. General principles of microbial disease transmission – waterborne, airborne, foodborne, arthropod-borne and contagious diseases. Concepts of epidemics and pandemics. Hospital acquired (Nosocomial) infections. Emerging and re-emerging infectious diseases. Types of public health interventions. Preventive measures in the control of bacterial, parasitic, fungal and viral infections.Principles of microbial disease surveillance. Water microbiology. Principles and techniques for water treatment. Waste water disposal.

NDU – MLS 574 DIAGNOSTIC IMMUNOLOGY (2 Units; C; 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 NDU 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 will provide a more specialized training to students to handle sophisticated equipement using appropriate methods in Medical Laboratory microbiology and parasitology for the diagnosis of diseases and reasearch.

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

Objective

The objective is to enable students to
1. explain the basis of immune response to infection and disease
2. describe the mechanism of organ and tissue transplantation and rejection
3. discuss the principles and procedures of diagnostic immunologic techniques
4. describe antigen presentation and cellular interactions
5. describe the structure of the various classesantibodies
6. perform several immunological investigations
7. describe the human leucocyte classes
8. explain reproductive and transplantation immunology

Learning Outcome

At the end of the course the students are able to
1. explain the basis of immune response to infection and disease
2. describe the mechanism of organ and tissue transplantation and rejection
3. discuss the principles and procedures of diagnostic immunologic techniques
4. describe antigen presentation and cellular interactions
5. describe the structure of the various classesantibodies
6. perform several immunological investigations
7. describe the human leucocyte classes
8. e xplain reproductive and transplantation immunology

Course contents

Structure of antibodies and Antibody classes, epitopes, antigens, complement system, immunological tests: agglutination, precipitation, enzyme linked immunosorbent assay (ELISA), complement fixation test, radio-immunoassay (RIA), immunofluorescent test. Hypersensitivities and immune disorders, Human leucocytes antigens, reproductive and transplantation immunology. Immunity and infections (Viral, bacterial, fungal, parasitic, helminthic infections).

Tissue and Organ transplantation, Foetus as an allograft. Diagnostic tests for assessing cellular and humoral immune responses. Molecular immunology: structural principles of receptor interactions in the immune system, mechanisms of VDJ rearrangement and class switch recombination, T cell recognition of antigen, mechanisms of antigen presentation and co-stimulation, innate recognition of pathogens (Toll Like Receptors, Nod-Like Receptors, etc).

NDU- MLS 575 :MEDICAL VIROLOGY (2 credit units C: LH 15, PH45)

Senate approved relevance

Graduates who are highly skilled at providing specialized diagnosis in medical microbiology and parasitology is in accord with NDU 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 virology will provide a more specialized training to students to handle sophisticated equipement using appropriate methods in Medical Laboratory microbiology and virology for the diagnosis of diseases and reasearch.

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

Learning Objectives

The objective is to enable students to

1. describe how viruses were first discovered and how they are detected.
2. explain the basic shapes and morphology of viruses.
3. describe the classification system for viruses.
4. Discuss the cultivation, assay and replication of viruses.
5. discuss taxonomic subdivision of viruses and for the most important human pathogenetic viruses.
6. explain pathogenesis and epidemiology in relation to viral properties and the function of the immune system.
7. explain the rationale behind the Baltimore classification system of viruses and present
8. describe viral strategies to evade host immune and cellular factors (by use of examples of viruses relevant for human disease).
9. discuss principles of virus pathogenesis.
10. compare and contrast methods used for laboratory diagnosis of viral infections.
10. explain vaccine strategies and mechanisms of antiviral drugs.

Learning outcome

At the end of the course, the student are able to:

1.describe how viruses were first discovered and how they are detected.

2.explain the basic shapes and morphology of viruses.

3.describe the classification system for viruses.

4.Discuss the cultivation, assay and replication of viruses.

4.discuss taxonomic subdivision of viruses and for the most important human pathogenetic viruses.

5.explain pathogenesis and epidemiology in relation to viral properties and the function of the immune system.

6.explain the rationale behind the Baltimore classification system of viruses and present

7.describe viral strategies to evade host immune and cellular factors (by use of examples of viruses relevant for human disease).

8.discuss principles of virus pathogenesis.

9.compare and contrast methods used for laboratory diagnosis of viral infections.

10.explain vaccine strategies and mechanisms of antiviral drugs.

Course Content

Morphology and life cycle of viruses, nomenclature and classification – various methods. Various methods of reproduction, resistance, pathology, collection of clinical specimens for viral culture. Culture methods for isolation of viruses. Purification, immunity and laboratory diagnosis of viral infections – Haemagglutination test, CFT, Neutralization test. Systematic study of viral diseases. Interferon, immuno-therapy and haemo-therapy in viral infections, inclusion bodies and cytopathic effects. Viral/host interactions and identification. Viral vaccines and immune-prophylaxis. Background information on laboratory diagnosis of HIV infection, Laboratory diagnosis of HIV, Hepatitis, Yellow fever and other endemic viral diseases of man and animals, emerging Viral diseases, Quality control, Quality assessment and Quality assurance. HIV counselling and testing (HCT).

NDU-MLS 576 Final Professional Examination (3 Units C: LH -15; PH 60)

Senate approved relevance

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with NDU 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 an evidence of specialized psychomotor experience acquired within the first four years of training through the demonstration of basic laboratory tests in microbiology

Objectives

The objectives of this course is to enable students to:

1. demonstrate specialized laboratory tests in gram stain
2. demonstrate specialized laboratory tests in biochemical testing
3. demonstrate specialized laboratory tests in colony identification
4. demonstrate specialized laboratory tests in blood parasites
5. demonstrate specialized laboratory tests in tissue parasites
6. demonstrate specialized laboratory tests in infection
7. demonstrate specialized laboratory test malaria microscopy
8. demonstrate specialized laboratory tests indirect blood culture

Learning Outcomes

At the end of the course, the students are able to:

1. carry out 20 specialized laboratory tests in gram stain
2. carry out 5 specialized laboratory tests in biochemical testing
3. carry out 10 specialized laboratory tests in colony identification
4. carry out 10 specialized laboratory tests in blood parasites
5. carry out 5 specialized laboratory tests in tissue parasites
6. carry out 10 specialized laboratory tests in infectous organism
7. carry out specialized laboratory test in malaria microscopy
8. carry out specialized laboratory tests in blood culture and sensitivity

Course content

This is a buildup 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).

500 LEVEL (CHEMICAL PATHOLOGY)

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

Learning Outcomes

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

1. show or demonstrate competency in independent running of a medical laboratory as a full fledge professional;
2. display right administrative acumen in the running of a medical laboratory facility; and
3. impart the right knowledge and professional know how to upcoming students and scientists.

Course Contents

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

MLS 503: Practical Exercises II (2 Units C: PH 45)

Each student carries out practical based on the area of major specialty.

Clinical Chemistry

Determination of blood glucose, glucose tolerance test. Determination of calcium and phosphate, uric acid, cholesterol, creatinine clearance, electrolytes and urea, total protein albumin and globulin. Plasma protein electrophoresis. Determination of plasma enzymes: - aspartate transaminase, alanine transaminase, acid and alkaline phosphatase. Demonstration. Blood gases and pH by Astrup Technique. Paper and thin layer chromatography, Immuno-electrophoresis and agar gel immuno-diffusion techniques. Demonstration: Radioimmunoassay of hormones in blood. Estimation of 17-oxo and Oxogenic steroids in urine. Estimation of urinary buffers. Calculation from first principle. Absorption and calibration curves. Colour Equivalence of artificial standards. Fractional test meal. Calculi analysis.

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

Learning Outcomes

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

1. explain laboratory procedures including safety precautions;
2. carry out independent researches that will lead to tangible outcomes; and
3. present outcome of their researches in seminars and conferences.

Course Contents

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

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

Learning Outcomes

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

1. identify a topic of current interest in any branch of medical laboratory science;
2. search for the appropriate literature in the chosen topic; and
3. prepare and disseminate the knowledge using the appropriate format within a time frame.

Course Contents

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

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

Learning Outcomes

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

1. describe basic concepts of general principles of enzymes kinetics;

2. discuss analytical techniques employed in qualitative and quantitative determination of enzymes; and 3. describe basic concepts of activation.

Course Contents

Analytical Techniques. Birth of a new method, devising new techniques, biological trials and tests for acceptability. Solid/dry phase chemistry, dipstick technology, thin film technology. Immobilised enzymes. Analytical techniques employed in qualitative and quantitative determination of (a) Enzymes: phosphatases, transaminases, dehydrogenases, Kinases (b) Hormones: catecholamines and metabolites peptide and steroid hormones (c) Proteins: total proteins albumin and globulin, specific proteins (d) Lipids: cholesterol, triglycerides, glycerol, fatty acids and lipoproteins. (e) Trace elements – Fe, Cu Zn, Mg, Selenium (f) non-protein nitrogen – Urea, creatinine, creatine, uric acid, amino acids and ammonia Urinalysis; determination of urine specific gravity, osmolarity; qualitative tests for protein, glucose. and reducing substances, Ketone bodies, bilirubin urobilinogen and blood. Haemoglobin and haemoglobin derivatives in urine. Spectroscopy of haemoglobin and its derivatives in blood and urine.

NDU-MLS 581 : CLINICAL TOXICOLOGY (2 Units : C, 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 NDU 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

Clinical toxicology will provide a more specialized training to students to handle sophisticated equipement using appropriate methods in clinical chemistry for the diagnosis of diseases and reasearch.

The course entails basic concepts of biochemical basis for identification of drug and toxins of medical importance, systemic infections, basic concepts on basis for identification of toxins of

medical importance, basic skills for the control of hospital infections and identification of microbes

Learning objective

Objectives is to enable students to

1.state the principles of poisoning,

2.expalin screening procedures and therapeutic drug monitoring

3. discuss biochemical mechanics of drug abuse and physiological consequences

4.describe essential and non-essential trace elements and the mechanism of heavy metal poisoning

5. describe basic concepts of clinical toxicology;

6. discuss analytical techniques employed in determination of toxic substances

7 discuss analytical techniques employed in determination of heavy metals poisoning

Learning Outcome

At the end of the course the students are able to

1.state the principles of poisoning,

2.expalin screening procedures and therapeutic drug monitoring

3. discuss biochemical mechanics of drug abuse and physiological consequences

4.describe essential and non-essential trace elements and the mechanism of heavy metal poisoning

5. describe basic concepts of clinical toxicology;

6. discuss analytical techniques employed in determination of toxic substances

7 discuss analytical techniques employed in determination of heavy metals poisoning

Course Contents

Functions of a clinical toxicology Laboratory; Therapeutic drug monitoring (TDM), Identification of drugs in acute intoxication, urine testing for drugs abuse:basic pharmacokinetics, Techniques of drug analysis, immunological techniques, enzyme immunoassay, fluorescence polarization immunoassay, radioimmunoassay: chromatography, high- performance liquid chromatography, gas-liquid chromatography, thin-layer chromatography, spectrophotometry, atomic absorption spectrophotometry. Method for measurement of serum concentrations of drugs using HPLC. Drug over dosage: procedures for analysis ethanol, salicylates, acetaminophen, and barbiturates. Heavy metals: procedures for analysis of suspected heavy metal poisoning. Detection of toxic substance by specific procedure;Legal aspects of drug screening: specimen collection, specimen labelling and transportation, specimen testing and confirmation, medical review of the results, laboratory security, impairment. Detection of barbiturates, cocaine, heroine, opium etc. in urine, sweat, blood and duodenal aspirate. Estimation of blood salicylates, sulphonamides, blood O_2, CO_2 and pH. Trace elements – bioavailability function. Therapeutic drug monitoring. Heavy metal poisoning.

NDU –MLS 582: CLINICAL ENZYMOLOGY/ENDOCRINOLOGY (2Units, C:LH 15; PH 45)

Senate approved relevance

Graduates who are highly skilled at providing specialized in clinical enzymology and endocrinology is in accord with NDU 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

Clinical enzymology and endocrinology will provide a more specialized training to students to handle cases using appropriate methods in handling enzymes and endocrine disorder in diagnosis of diseases and reasearch.

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 enzymes of medical importance, basic skills for the control of enzymes and enocrine disorders in hospitals .

Objectives

The objectives is to enable students to :

1. describe basic concepts of enzymology
2. discuss analytical techniques employed in determination of enzymes
3. describe fundamental concepts of metabolic and endocrine metabolism.
5. discuss the fundamental principles of metabolic and endocrine diseases.
6. discuss apoenzymes and co enzymes
7.explain hormones and endocrine system

Learning Outcomes

At the end of this course, students are able to:

1. describe basic concepts of enzymology
2. discuss analytical techniques employed in determination of enzymes
3. describe fundamental concepts of metabolic and endocrine metabolism.
5. discuss the fundamental principles of metabolic and endocrine diseases.
6. discuss apoenzymes and co enzymes
7.explain hormones and endocrine system

Course Contents

The nature of enzymes. composition and structure. Apoenzymes and coenzymes. catalysts, reaction sites, specific reaction, anabolism and catabolism, enzyme classification, measurement of enzymes. principles of kinetic analysis. factors affecting enzyme measurement, factors affecting reference values for enzymes. isoenzymes, clinical usage of enzymes, enzymes as reagents or labels, plasma enzymes in diagnosis. Disorders of carbohydrate metabolism, diseases associated with hyperglycemia. diseases associated with hypoglycemia, investigation of disorders of carbohydrate metabolism, Disorders of lipid metabolism. lipids and lipoproteins constituents. investigation of disorders of lipids metabolism, , hormones and endocrine systems, endocrine disorders,. investigation of pituitary. adrenal, gonadal and thyroid function.

NDU-MLS 583- INBORN ERRORS OF METABOLISM/TUMOR MARKERS (2 Units C: 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 NDU 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

This will provide a more specialized training to students to handle sophisticated equipement using appropriate methods in clinical for the diagnosis of diseases and reasearch.

The course entails basic concepts of biochemical basis for identification of bacteria of medical importance, systemic infections.

Learning objective is to enable students to

1. describe the inherited disorders associated with the metabolism of biomolecules
2. discuss the screening procedures associated with their diagnosis

3 describe Basic concepts of tumour markers.

4.discuss analytical techniques employed in determination of tumour markers.

5. explain the role tumor markers in medicine

6.Explain disorders of amino acid metabolism

Learning Outcome

At the end of the course the students are able to

1. describe inherited disorders associated with the metabolism of biomolecules
2. discuss screening procedures associated with their diagnosis

.3 describe basic concepts of tumour markers.

4.discuss analytical techniques employed in determination of tumour markers.

5. explain the role tumor markers in medicine

6.explain disorders of amino acid metabolism

Course content

Disorders of carbohydrate metabolism e.g. glycogen storage disease, galactosaemia, fructose intolerance; Disorders of amino acid metabolism e.g. phenylketonuria, maple syrup urine disease, glutamic acidaemia type I.; Disorders of organic acid metabolism (organi-aciduria) e.g. alkaptonuria.; Disorders of fatty acid mitochondrial metabolism e.g. medium chain acyl dehydrogenase deficiency (glutamic acidaemia type 2).; Disorders of porphyrin metabolism (Acute Intermittent Porphyria).; Disorders of purine and pyrimidine metabolism e.g. Lesch-Nyan syndrome.; Disorders of steroid metabolism e.g. congenital adrenal hyperplasia.; Disorders of mitochondrial function e.g. Kearns-Sayne syndrome.; Disorders of peroxisomal function e.g. Zellweger syndrome.; Lysosomal storage disease e.g. Gaucher's disease Brief introduction of Neoplasia, Definition of Tumor markers,classification of tumor markers, biochemical effects of tumours, secreting tumors of tissues of the sympathetic nervous system, Hormonal effects of tumours in non-endocrine tissue, Laboratory testing for tumor markers,

NDU –MLS 584 RENAL HEPATIC FUNCTION/ FREE RADICAL (3 Units C: 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 NDU 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

The will provide a more specialized training to students to handle sophisticated equipement using appropriate methods in clinical chemistry for the diagnosis of diseases and reasearch.

The course entails basic concepts of biochemical concepts of medical importance, basic skills for the control of hospital infections and identification of systemic pathology

Objective

This is to enable students to :

1. explain basic concepts of inborn errors of metabolism
2. discuss analytical techniques employed in determination of inborn errors of metabolism
.3. describe basic concepts of free radicals in medicine and biology.
4. explain the scientific thinking about topics within free radical studies
5. discuss analytical techniques employed in determination of antioxidants.
6.. discuss the fundamental principles of free radical reaction.

Learning Outcomes

At the end of this course, students are able to:

1. explain basic concepts of inborn errors of metabolism
2. discuss analytical techniques employed in determination of inborn errors of metabolism
.3. describe basic concepts of free radicals in medicine and biology.
4. explain the scientific thinking about topics within free radical studies
5. discuss analytical techniques employed in determination of antioxidants.
6.. discuss the fundamental principles of free radical reaction.

Course Contents

Renal function, water and electrolyte homeostasis, perinatal asphyxia, bilirubin metabolism:unconjugated hyperbilirubinaemia, conjugated hyperbilirubinaemia and other causes of jaundice in the newborn, investigation of jaundice in newborn period,; Glucose metabolism, calcium, phosphate and magnesium metabolism, neonatal hyocalcaemia, rickets of prematurity, hypercalcaemia in the newborn period: Plasma proteins: Neonatal thyroid function: Inborn error of metabolism: general principles: patterns of inheritance, possible metabolic consequences, clinical importance of inborn errors of metabolism, Laboratory diagnosis of inborn errors of metabolism, Diseases due to inborn errors of metabolism. Introduction to oxygen toxicity and reactive oxygen species, what are free radicals and reactive oxygen species, sources of reactive species, what are antioxidant and antioxidants defences, oxidative

stress:consequences of oxidative stress: adaptation, damage, repair and death, Reactive species as useful biomolecule.: consequences of oxidative stress in disease, origin of oxidative stress in disease, significance of oxidative stress in disease. detection of free radicals and other reactive species.

NDU – MLS 585 Forensic Science (2 Units; C , LH 15, PH 45)

Senate Approved Relevance

The philosophy of this course, in line with the vision of the University, is to produce graduates who have the knowledge and skill to contribute to the welfare of the society, fight crime and enhance the medico-legal system. This course is important because it provides opportunity for graduates of Medical Laboratory Science to investigate crime, arson, and death, using their professional knowledge and skills.

Overview:

Forensic pathology is a unique branch of medicine that involves determination of cause of death by post-mortem examination of human remains and examination of the living for toxins and poisons. Post-mortem examination, also called autopsy is applied in various scenarios such as in determining cause of death especially in unnatural or suspicious circumstances, in solving criminal cases and identification of victim remains in cases of mass disasters amongst others.

Forensic investigations are also necessary for tracing of ancestral and familial lineage, examinations of victims of rape or abuse and diagnosis of victims of poisoning. From these, it is quite evident that forensic pathology is a broad and wide encompassing field of medicine, hence this course will provide students with all the information and knowledge needed in laboratory investigations involving the above circumstances.

Objectives

The objective of the course is to enable students are to :

1.define forensic pathology

1. state the history of forensic pathology
2. state the principle of DNA analysis and fingerprinting
3. describe the samples to be collected for a forensic examination
4. describe the process of forensic analysis in the living
5. describe the process of postmortem examination
6. describe forensic entomology
7. explain the scenarios that necessitate the application of forensic techniques
8. explain forensic toxicology and poisons

Learning outcomes

A the end of the the course, students are able to:

1.define forensic pathology

2.state the history of forensic pathology

3.state the principle of DNA analysis and fingerprinting
4.describe the samples to be collected for a forensic examination
5.describe the process of forensic analysis in the living
6.describe the process of postmortem examination
7.describe forensic entomology
8.explain the scenarios that necessitate the application of forensic techniques
9. explain forensic toxicology and poisons

Course content

Definition of Forensic Science. Branches of Forensic Science. History, Principles and Applications of Forensic science Practice and applications of forensic science. Crime scene management and forensic exhibit. Jurisprudence and forensic science. Collection of materials/samples of forensic interest. Types, mechanisms and causes of death. Signs of death and what to do with a dead body. Changes after death. The time of death. Identification of live dead human remains. Postmortem chemistry. Type of injuries. Poisons, classification of poisons. Investigation of a poisoning case. Extraction of poisons from tissues. Biochemical analysis in forensic, including modern instrumentation techniques. Identification of saliva, sex offences, blood stain and groupings, paternity briefs e.t.c. Arson. Crime-scene Investigation and Evidence Collection. Fingerprints. Forensic Entomology. Fundamentals of forensic anthropology. of trace and Contact Elements such as Fingerprints, Footprints, Hairs, Fibre and Other Marks and Impressions. of trace and Contact Elements such as Fingerprints, Footprints, Hairs, Fibre and Other Marks and Impressions. Embalment techniques and demonstrations, Mortuary organization and management

NDU-MLS 586 Final Professional Examination (3Units C: LH -15; PH 45)

Senate approved relevance

Graduates who are highly skilled at providing specialized and general medical laboratory diagnosis is in accord with NDU 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 an 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 parasitesand blood group serology

Objectives

The objectives of this course are to:
1. demonstrate specialized laboratory tests in blood glucose
2. demonstrate specialized laboratory tests in Liver function

3..demonstrate specialized laboratory tests in urea and creatinine
4..demonstrate specialized laboratory tests in electrolytes
5..demonstrate specialized laboratory tests in oral glucose tolerance
6..demonstrate specialized laboratory in urinalysis

Learning Outcomes

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

1. carry out 10 specialized laboratory tests in blood glucose
2. carry out 10 specialized laboratory tests in Liver function
3. carry out 10 specialized laboratory tests in urea and creatinine
4. carry out 10 specialized laboratory tests in electrolytes
5. carry out 10 specialized laboratory tests in oral glucose tolerance
6. carry out 10 specialized laboratory tests in urinalysis

Course content

This is a buildup 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).

LABORATORY POSTINGS :

Examination on Laboratory posting courses shall consist of :
Log book assessment-20%
Class Practicals-20%
Practical based Multiple Choice Questions(MCQ)-60%
This includes MLS 396, MLS 491, MLS 492, MLS 591 and MLS 592.

PROFESSIONAL EXAMINATIONS

Shall come up not later than three (3) weeks after the Semester examinations
First professional examination shall be taken at 400 level second semester and shall be a pre-requisite for the FINAL professional examination which is also taken at the end of second semester examinations in 500 Level. The first Professional examinations shall comprise of assessment from laboratory posting log-books, oral examination, Multiple Choice Questions (MCQ) and practicals. The scores shall be shared as follows:

(i) Practical examination: one three-hour paper in all the core disciplines= **40% for 1st Professional examination and 50% for 2nd Professional Examination**

(ii) MCQ (20 each in all the core disciplines) = **30% for 1st Professional examination and 20% for 2nd Professional Examination**

(iii) LOG Book assessment =**10%**

(iv) Viva =**20%**

The **PROFESSIONAL EXAMINATION** shall be externally assessed by the Medical Laboratory Science Council of Nigeria. The pass mark of the **first professional examination** shall be **50%.**

All **Year Four Students** who have passed the First Professional Examination shall be eligible for the **final professional examination**. The Final Professional Examination shall comprise assessment from laboratory posting log-books, oral examination, Multiple Choice Questions (MCQ) and practicals. The scores shall be shared as follows:

(i) Practical examination: one three-hour paper in all the core disciplines = **50%**

(ii) MCQ (20 each in all the core disciplines) = **20%**

(iii) LOG Book assessment =**10%**

(iv) Viva =**20%**

The pass mark of the **final professional examination** shall be **50%.** In addition, all **Year Five (FINAL YEAR) Students** shall conduct a research project on an approved topic under the supervision of a lecturer from the Department and subunit it a written report for assessment by an **examiner(s)** nominated by the Department and so appointed by the University. The assessment shall be based on both the quality of the write up and oral defence.

ELIGIBILITY TO WRITE THE PROFESSIONAL EXAMINATION

Every student **must** record at least 75% attendance at lectures and laboratory postings and must have been indexed with the MLSCN.

INELIGIBILITY TO WRITE THE PROFESSIONAL EXAMINATION

Any student who absents him or herself from the laboratory posting for **four weeks** without permission from the Head of Department or the assigned "Supervisor" shall not be allowed to take the professional examinations for that year. Any student who has not been indexed by the MLSCN shall not be presented for any professional examination.

GRADING PATTERN OF RESULTS

Performance in each course shall be graded as follows:

70 - 100 %	A	5 Grade Point
60 - 69%	B	4 Grade Point
50 - 59 %	C	3 Grade Point
45 - 49%	D	2 Grade Point
40-44%	E	1 Grade Point

CALCULATION OF GRADE POINT AVERAGE (GPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA):

The performance of a student in an examination in the first semester is reported as Grade Point Average (GPA), while the overall performance at the end of the session (and/or at

any point in his/her study programme) will be reported by Cumulative Grade Point Average (CGPA).

Grade Point Average (GPA):

Grade Point Average (GPA) is calculated by dividing the total grade points with the total units registered in a given semester.

GPA=Total number of credit units of registered courses in the semester
Total number of grade Points of registered courses in the semester

The total grade Points (GP) earned in a given course is obtained by multiplying the grade point obtained by the candidate by the credit unit of the course.

Cumulative Grade Point Average (CGPA):

Cumulative Grade PointAverage (CGPA) is the sum of all the total grade Points (GP) earned in all the semesters divided by the sum total number of units attempted in all the semesters. This is an updated mean of the grade Points (GP) earned by the candidate. It is an indication of the student's overall performance at any given point in the learning programme.

GRADUATION REQUIREMENTS/INDUCTION

For a student to graduate from this programme, the candidate must have spent a minimum of four (4) years and have passed all the courses in this curriculum including the professional examinations. All successful students must be **inducted** by the Medical Laboratory Science Council of Nigeria (MLSCN).

DEGREE CLASSIFICATION

Based on the Cumulative Grade Point Average (CGPA) calculated for each student at the end of the programme, the degree shall be classified as follows:

CLASS OF DEGREE	**CGPA**
FIRST CLASS	4.50-5.00
SECOND CLASS (UPPER DIVISION)	3.50-4.49
SECOND CLASS (LOWER DIVISION)	2.40-3.49
THIRD CLASS	1.50- 2.39
PASS DEGREE	Less than 1.49

AWARD OF DEGREE

Any student who meets the **graduation requirements** of the B.MLS Degree Programme shall be awarded the B.MLS Degree of this University.

INDEXING/REGISTRATION AS STUDENT AND ASSOCIATE MEMBER OF THE MEDICAL LABORATORY SCIENCE COUNCIL OF NIGERIA (MLSCN)

All students enrolled into the programme must be registered with the MLSCN as student members at 300 Level. After the mandatory one year internship programme, internees should also register with MLSCN as Associate Members. This registration will afford them a license that will enable them to practice in Nigeria as Medical Laboratory Scientists. The license is renewable every year.

DRESSING CODE

During Lectures and Laboratory postings, male and female students must be corporately dressed. Wearing of jeans trousers, traditional wears or revealing wears, loose clothing, dyed, long artificial nails and flying hair is prohibited. Defaulters will be bound from participating in lectures or lab postings as the case may be.

Equipment requirement

HISTOPATHOLOGY/ CYTOLOGY

s/no	Name of equipment	Number required
1	Rotary microtome	2
2	Microtome knives (Disposable and non disposable)	10Packets / 5
3	Light microscopes -	1per 2students
4	Slides of sections/slide projector	1
5	Dissecting microscopes	3
6	Cryostat with microtome	1
7	Tissue processing machine	2
8	Multihead Teaching Microscope	1
9	Floating water bath	2
10	Weighing balance	2
11	Staining troughs	50pcs

12	Slide boxes	50pcs
13	Prepared slides in all organs	5pcs
14	Wax dispenser	2
	HAEMATOLOGY /BLOOD TRANSFUSION SCIENCE	
1	Autoanalyzers - 2	2
2	Microscopes	1 per 2students
3	Waterbath	1 per 10students
4	Haematocrit centrifuge	1 per 4students
5	Electrophoresis tank and powerpack	1 per 4students
6	Colorimeters	1 per 4students
7	Bench centrifuges	1 per 10students
8	Weighing Balance	1 per 10 students
9	Neubauercountingchamber	1 per 4students
10	pH meter	1 per 10students
11	Coldcentrifuge	1
12	Coagulometer	2
13	Platelet Aggregometer	1
	Medical Microbiology/Parasitology	
	Binocular microscopes	1 per 2students
	Fluorescent microscope	1per 10students
	Magnifying lens	1 per student
	Centrifuges	1per 10students
	Incubators	1 per 10 students
	Anaerobic culture jars	1 per 10 students
	Membrane/sietz filters	1 per 5 students
	Metler balance	4
	Autoclaves	2
	Deioniser	2
	Water baths	2
	Hot air ovens	3
	Bunsen burners	1 per4 students
	Freezers	1 per20students
	Ultra-centrifuge	1

	Chemical Pathology/Immunology	
	Electronic balance - 2	2
	Spectrophotometer	1per 20students
	pH Meters	1per 20students
	Atomic absorption spectrophotometer	2
	Auto analyzers	2
	Colorimeters	6
	Flame Photometer	2
	Water distiller	2
	Gas, Liquid, TLC chromatographs	2
	Vacuum pumps	2
	Rotary evaporator	2
	Centrifuge	2

Staffing Academic Staff for Each unit /department

The academic staff should have Ph.D. degrees in relevant disciplines of Medical Laboratory Science. The existing guideline that states that 70% and above of the academic staff should possess Ph.D shall apply. One academic staff per 15 students (1:15) should be equitably distributed in the disciplines.

Staff Mix by Rank for Each unit /department :

The staff mix by rank of Professors, Senior Lecturers and Lecturer 1 and below of 20:35:45 shall apply.

Non-Academic Staff (Senior Technical Staff)

This is comprised of qualified and registered Medical Laboratory Scientists and should be at least 25% of the strength of the Academic Staff in the department.

Library Allied Health Sciences

Each Unit of Medical Laboratory Science should have a well-stocked library with upto date journals and books relevant to Medical Laboratory Science. There should be computer based information service and e-Libraryfacilities. Establishment of an audiovisual Laboratory/Learning Resources with Phantoms, CD Roms, and many others.

Classroom, Laboratories and Offices Space Classroom

The standard requirement of 0.65m2 per full-time student should be maintained. Thus the minimum total space requirement for a faculty or department shall be the product of its total full

time equivalent student enrolment (FTE) and the minimum space requirement per full-time equivalent i.e. (FTE) 0.65m².

Office space

In this respect, each academic staff should have an office space of at least 25 square metres taking into cognisance the status/cadre of the staff In addition, there should be for the Faculty, a Dean's office and for each Department a Head of Department's office with attached offices for their supporting staff as specified below in m2 :

Professor's office	- 18.50
Head of Department's office	- 18.50
Tutorial teaching staff's office	- 13.50
Other teaching staff space	- 7.00
Technical staff space	- 7.00
Secretarial space	- 7.00
Staff research laboratory	- 16.50
Seminar Space/per student	- 1.85
Laboratory space (per student)	- 7.50