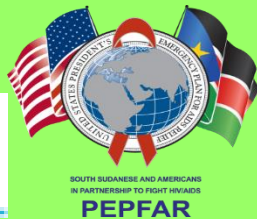




**MINISTRY OF HEALTH
REPUBLIC OF SOUTH SUDAN**

**Curriculum
For
Diploma in Medical Laboratory Sciences**



FEBRUARY 2016

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Foreword

After experiencing decades of civil war, South Sudan's health care and medical laboratory education challenges remain daunting. In September 2013 representatives from the African Society for Laboratory Medicine (ASLM), the Ministry of Health, Republic of South Sudan and the Centers for Disease Control and Prevention (CDC) South Sudan met to discuss a new three-stage pre-service medical laboratory sciences curricula revision project in South Sudan. The project goal was to improve the quality of medical laboratory science education in South Sudan, to better prepare graduates with professional skills and competence in laboratory performance and to have a training programme that addresses the needs of South Sudan. The project objectives included:

- 1) To identify gaps in the curricula housed at the health training institutions;
- 2) To revise the curricula based on the identified gaps; and
- 3) To conduct stakeholder curriculum review and development workshops for the new curricula.

For stage one, ASLM consultants conducted site assessments at three medical laboratory training schools (Rumbek, Yei, and Juba) and their associated student clinical placement laboratories to ascertain the current curricula in use and to identify initial gaps in the curricula. Clinical site assessments were conducted to ascertain the level of harmonisation between what students were taught in the curricula and during their clinical attachment. The consultants found gaps within areas such as course structure, teaching and learning materials, classroom and laboratory equipment and supplies, clinical training, infrastructure, staffing and funding.

The second and third stages of the project included a stakeholder curriculum review and development workshop in June 2014 and a stakeholder workshop on orientation, sensitisation and implementation planning for the new curricula in September 2014. Results of the curricula revision and development process included:

- Restructuring and upgrading the curricula in terms of changing the grading system to a higher standard;
- Sequencing courses;

- Restructuring from term to semester-based curricula;
- Adding courses such as public health and laboratory safety;
- Assigning academic credit units;
- Strengthening course outlines by upgrading course content;
- Revising learning objectives;
- Incorporating required textbooks and electronic references;
- Introducing student performance assessment forms for both classroom and clinical attachment activities, among other improvements.

This new curriculum advances medical laboratory science education in South Sudan, which will strengthen medical laboratory service capabilities to better evaluate and respond to the specific needs of the country and the region. This initiative contributes to workforce development, one of the strategic goals of the ASLM 2020 vision, and supports the MoH's vision of improving the health status of the population and providing quality health care to all the people of South Sudan, especially the most vulnerable women and children.

1.0 Introduction

1.1 Geography and Population

South Sudan became the newest state in Africa on July 9, 2011 as a result of a referendum held in January 2011. Preceding the referendum was 22 years of civil conflict between North and South that ended in 2005 by the signing of the Comprehensive Peace Agreement. The civil war resulted into the destruction of all health infrastructure and health care services in the country.

South Sudan is a landlocked country bordering Sudan to the north, Ethiopia to the east, Kenya, Uganda and Democratic Republic of Congo to the south and Central African Republic to the west. The country has a land area of 644,329 square kilometres and is administratively divided into 10 States and 79 Counties within which there are Payams and Bomas as the lowest administrative unit.

South Sudan has a population of 8.26 million (5th Sudan Population and Housing Census, 2008), an annual growth rate of 3%, and a fertility rate of 6.7.

1.2 Social Economic Situation

The World Bank (<http://data.worldbank.org/>) categorises South Sudan as a Low Income Country. In addition to high levels of poverty, South Sudan has a high disease burden and low levels of education, with an adult illiteracy rate of 88% and 63% in women and men, respectively.

1.3 Health Situation

The people of South Sudan have experienced poor health care provision due to the long episodes of civil conflict. General coverage of health services is well below 30%, and as a result, South Sudan has some of the worst key health indicators globally:

- Maternal Mortality Ratio (MMR) is 2,054 per 100,000 live births
- Infant Mortality Rate is 89 per 1000 live births
- Under-five mortality is 108 per 1000 live births

The major causes of death among children under five years include malaria, pneumonia, diarrhoeal diseases, and malnutrition.

HIV prevalence in the general population is estimated at 2.6% according to the 2012 antenatal sentinel surveillance. The prevalence varies from 0.3% in Northern Bahr el Ghazal to as high as 6.8% in Western Equatoria.

1.4 Health System

Health service delivery is structured into three tiers; primary health care units and primary health care centres, county hospitals and state referral hospitals.

According to the Health Facility Mapping 2011, there are 1,147 functional health facilities that included 3 Teaching Hospitals, 7 State Hospitals, 27 County Hospitals, 284 Primary Health Care Centres, 792 Primary Health Care Units, 10 private facilities, 14 specialised hospitals/clinics and 10 police and military health facilities. It is estimated that 44% of the population are settled within a 5 kilometre radius of a functional health facility. In 2008, the health facilities carried out 2.8 million consultations (the per capita Out Patient Department [OPD] utilisation rate is calculated at 0.4 visits per annum) and provided in-patient services to 138,395 patients. Half of all consultations took place in the three teaching hospitals of Wau, Malakal and Juba, a quarter were seen in the Primary Health Care Centres (PHCCs) and County and State hospitals, while the rest were seen in the Primary Health Care Units (PHCUs) (HFM 2011).

South Sudan has a critical shortage of all health professional cadres. About 10% of civil service posts are filled by qualified health workers, which translates to about 3 physicians, 27 nurses, 6 midwives, and 5 medical laboratory technicians for every 100,000 citizens. According to the HFM 2011, the majority of the medical laboratory technicians are based in Central Equatoria (150 out of 436) and the least (17 out of 436) in Northern Bahr el Ghazal. Currently South Sudan has four medical laboratory training institutions located in Central Equatoria State and Lakes State with an annual output of about 60 laboratory technicians.

In 2006, South Sudan developed pre-service training curricula for certificate, diploma and higher diploma in medical laboratory sciences. Of the three curricula developed, only the certificate curriculum has been fully and successfully implemented in Rumbek and Yei, while adapted versions of the curricula from Sudan and East African countries have been used by the Juba Health Sciences Institute.

Medical laboratory training institutions are supervised by the Directorate of Medical Training and Professional Development in the Ministry of Health. Other functions of the Directorate include:

- Formulation of training policies;
- Guidelines, and communication of these with the MoH, SMOHs, training institutions, development partners, members of HRH-TWG and other stakeholders;
- Selection of eligible applicants for entrance into health training programmes;
- Provision of support to the national examination committee;
- Provision of financial and technical support to health training institutions;
- Monitoring of performance of health training institutions;
- Coordination and management of professional development for eligible staff;
- Promotion of effective collaboration and communication with relevant sectors, development partners and stakeholders;
- Development of guidelines and screening of applicants for scholarship programmes;
- Collaboration with other directorates and institutions to devise and implement their training plans.

2.0 Mission of the Ministry of Health

The mission of the Ministry of Health is to improve the health status of the population and provide quality health care to all the people of South Sudan, especially the most vulnerable, women and children. In order to achieve this mission, the Ministry of Health has prioritised increasing the number of health workers trained, expanding the number

of facilities across the country, improving the management, motivation, and deployment of health workers and ensuring robust systems are in place.

3.0 Need for Training Medical Laboratory Technologists

There are four medical laboratory training institutes registered at the Ministry of Health in South Sudan providing basic medical laboratory training. Three of the institutes are government owned and include the Juba Health Sciences Institute, Rumbek and Yei Health Science Institutes while Kajo Keji is a private health training institute. Yei and Rumbek training schools have been providing 2-year certificate programmes, while Juba Health Sciences was providing 3-year training leading to award of a Diploma in Medical Laboratory Sciences. The newly established Kajo Keji Health Training School is also expected to train diploma holders in medical laboratory sciences. The annual average output from the three institutions is 60. According to an assessment of laboratory training programmes conducted by the African Society for Laboratory Medicine in September 2013, the certificate-level curriculum appears to be adequate for preparing level-1 laboratory personnel. However, the course curriculum and clinical attachments need to be strengthened and fully implemented. Secondly there is need for significant development work in the areas of assessment tools, course modules, instructional objectives, teaching strategies and clinical performance evaluations. It is also worth noting that the curriculum in use is due for review after being in use for eight years.

This curriculum has therefore been restructured and the course contents revised to equip graduates with sound scientific knowledge, skills, and technical competence in medical laboratory sciences needed to elevate the quality of patient care of the people of South Sudan and the region.

4.0 Rationale for the curriculum

The level of formal education and health status of a country's population has direct influence on national and economic development. Although current training courses adequately prepare laboratory staff to perform basic tasks, there is need for a comprehensive diploma programme to equip Medical Laboratory Technologists with the

competencies to meet the technical challenges within laboratory services in the developing health system of South Sudan. The design, content and implementation process of this curriculum ensures that Medical Laboratory Technologists will be well equipped to participate in fulfilling the mission of the Ministry of Health.

This comprehensive curriculum for training Medical Laboratory Technologists at Diploma level has been developed through the efforts of the Ministry of Health in collaboration with the U.S. Centers for Disease Control and Prevention (CDC) and the African Society for Laboratory Medicine (ASLM).

5.0 Medical Laboratory Technologists

5.1 Job Title

The Medical Laboratory Technologist in South Sudan is a second level health professional who has successfully completed the prescribed three years' diploma programme and is qualified to practice under the regulations laid down by the Ministry of Health, Republic of South Sudan. The Medical Laboratory Technologist is responsible and accountable for continued improvement of competence and ethical behaviour in the laboratory profession. The Medical Laboratory Technologist's practice occurs within partnerships with the client and other stakeholders in the health sector. The Medical Laboratory Technologist responds to patients' and clients' actual and felt health care needs by providing scientifically-based, holistic and comprehensive care as stipulated in the Diploma of Medical Laboratory Sciences curriculum.

5.2 Roles and Functions of Medical Laboratory Technologists

The graduate will perform the following roles and functions upon the award of a **Diploma in Medical Laboratory Sciences** and a licence to practice:

1. Conduct analysis of laboratory samples
2. Manage a hospital laboratory at county level
3. Manage laboratory resources
4. Manage laboratory data
5. Prepare and disseminate reports
6. Plan and set up a laboratory

7. Care for laboratory equipment and conduct minor maintenance procedures
8. Participate in budgeting and procurement of laboratory supplies
9. Incorporate safety procedures in all laboratory work
10. Provide support supervision and training of junior laboratory staff
11. Conduct laboratory quality assurance and quality control protocols
12. Communicate and interact effectively with clinical staff and other health care providers
13. Practise good customer care
14. Participate in disease surveillance, outbreak investigations and other public health activities
15. Initiate and participate in improving diagnostic laboratory procedures
16. Refer specimens to reference laboratories
17. Participate in research
18. Participate in Continuing Professional Development Programmes

6.0 Target Group

The programme targets candidates who have a South Sudan Secondary School Certificate or its equivalent e.g. Kenyan Certificate of Secondary Education, Ugandan Advanced Certificate of Education or any other equivalent qualification. In addition, the programme targets Laboratory Technicians with a minimum of two years working experience post qualification. Laboratory Technicians will be admitted as in-service trainees.

7.0 Admission Requirements and Selection Panel

7.1 Admission Requirements

Admission criteria into medical laboratory training programme have far reaching implications in teaching and learning processes and also in the outcomes of the programme i.e. the graduates and the services provided. The admission requirements into the Laboratory Technologist Training Programme have been considered in the light

of the prevailing and future health situation in South Sudan. The following minimum criteria have been found appropriate.

Candidates for direct or in-service admission into the Diploma programme in Medical Laboratory Sciences must possess a South Sudan Certificate of Secondary Education, Kenya or Uganda Advanced Certificate of Education, or their equivalents, or a certificate in medical laboratory science from a recognised institution and with documented evidence of a minimum working experience of two years, in accordance with the following **minimum** requirements:

a) Direct Entry

South Sudan system

A South Sudan Certificate of Secondary School Education with a pass score of 65% in each of the following subjects:

1. English
2. Biology
3. Chemistry
4. Mathematics
5. Physics

Ugandan system

Advanced level, with a principal pass in any of the following subjects:

1. Physics
2. Chemistry
3. Mathematics
4. Biology

Kenyan system

Mean Aggregate of at least a grade of B in the Kenya Certificate of Secondary Education (KSCE) i.e. 'Form 4'. In addition the candidate must score at least a grade of B in English, Biology, Chemistry, Mathematics and Physics.

b) In-service entry

Any individual with a certificate in medical laboratory science from a recognised institution and with documented evidence of a minimum working experience of two years. The candidate must sit and pass an entrance examination.

Note: The Health Personnel Council, together with the training schools, will establish a system of transferring credits for Laboratory Technicians to the Diploma programme. A standard induction course with specific content and duration in all training schools will equip the Laboratory Technician with only the competencies previously not acquired. The candidates will enter the programme at an appropriate level determined by the Health Personnel Council in collaboration with the training schools, after successful completion of the induction course.

7.2 Selection panel

The Ministry of Health shall advertise the training opportunities in the Diploma of Medical Laboratory Sciences course and facilitate the process of interviewing candidates for selection. The selection panel shall comprise health workers from hospitals and PHCCs, MOH representatives and tutors from the training schools.

8.0 Programme Goals and Objectives

8.1 Goal

The goal of the Diploma in Medical Laboratory Sciences programme is to provide the human resource required for quality and comprehensive laboratory practice in South Sudan.

8.2 General objective

The general objective of the Medical Laboratory Technologists' programme is to provide Laboratory Technologists with the scientific knowledge, clinical and practical skills and ethical and professional attributes that are required for the provision of effective and quality medical laboratory services in South Sudan.

8.3 Specific objective

The Diploma in Medical Laboratory Sciences programme will:

1. Provide the learners with opportunities for developing scientific knowledge, skills and attitudes that facilitate acquisition of an in-depth understanding of disciplines related to medical laboratory practice.
2. Provide an opportunity for the learner to develop and apply critical thinking and reflective skills necessary for medical laboratory practice.
3. Enhance the learners' critical understanding of emerging concepts, principles and approaches related to medical laboratory practice.
4. Facilitate the development of research awareness and skills of critical enquiry that enhance evidence-based medical laboratory practice.

8.4 Expected outcomes

Upon successful completion of the programme, the graduate will demonstrate the knowledge, attitudes, skills and ethics necessary in medical laboratory practice to enable him/her to:

1. Accurately perform laboratory procedures
2. Accurately prepare laboratory reagents
3. Collect, pack, store and transport specimens safely to other laboratories
4. Manage laboratory records
5. Ensure proper control of stock in the laboratory
6. Properly operate and maintain laboratory equipment
7. Maintain a safe working environment
8. Incorporate quality control procedures in all laboratory work
9. Participate in external quality assurance schemes
10. Effectively supervise other laboratory staff
11. Collaborate effectively with other health care providers
12. Participate in disease surveillance and outbreak investigation
13. Organise and participate in field work and research projects
14. Plan continuing professional development for him/herself and others

15. Demonstrate the ability to evaluate his/her own performance
16. Monitor and evaluate the proficiency of laboratory practice
17. Communicate effectively with different stakeholders, interested parties and the community

9.0 Programme Duration, Design, Structure and Organisation

9.1 Duration

The Diploma programme in Medical Laboratory Sciences is designed to take a minimum of three (3) years for **pre-service** training. This is a total of 36 months of eight hours per day sessions, which is equivalent to **5445** hours. The total period for theory, practical and clinical attachments is **4825** hours and the remaining period of **620** hours is allocated for revision and examinations, and marking of end of year examinations as shown in the programme structure. However a candidate may take a maximum of thirty nine (39) months pre-service training subject to the examination requirements and regulations governing the conduct of Continuous Assessments and Final Qualifying Examinations of the programme.

The programme is also designed as an **in-service** training course for laboratory Technicians. The duration is a minimum of two years or 24 months, including an induction course during the first year. However a candidate may take a maximum of 27 months subject to the examination requirements and regulations governing the conduct of Continuous Assessments and Final Qualifying Examinations of the programme.

9.2 Design

This is a competency-based programme emphasising mastery of prerequisite competencies before graduates can enter laboratory practice. The programme is designed to use participatory-based laboratory training approaches, which make the teaching and learning student-centered. Principles of adult learning and problem-based learning strategies are key pillars of the educational programme. The curriculum is designed to integrate knowledge, skills, attitudes, values and beliefs that facilitate development of a competent Medical Laboratory Technologist. The programme focuses

the students on acquisition and application of concepts, principles and approaches as well as practical skills in medical laboratory sciences. Clinical attachments are designed to take place during the **second and third** year of training where there is minimal classroom teaching. The programme is structured to provide 40% of the time to addressing theory and 60% to practice.

9.3 Structure and Organisation

The programme follows an eight-hour per day, 40 hours per week schedule making a total of **4825** hours of training. The training programme has **six semesters** and each semester has 22 weeks. The following table shows the programme structure and organisation over three years.

Year 1, Semester 1, 22 weeks

Code	Module	Units	Lecture Hours	Practical Hours	Total Hours	Credits	Level
CHE1001	MODULE 1: Chemistry	1. General Chemistry	30	30	60	4	1
CLP1002	MODULE 2: Computer Application to Laboratory Practice	1. Introduction to Computers 2. Computer Literacy	40	20	60	4	1
EPE1003	MODULE 3: Entrepreneurship Education	1. Entrepreneurship Education	40	20	60	4	1
HAP 1004	MODULE 4: Human Anatomy and Physiology	1. General Anatomy 2. General Physiology	80	15	95	6	1

LIN 1005	MODULE 5: LaboratoryInstrumentation	1. Laboratory Instrumentation	45	15	60	4	1
HSM 1006	MODULE 6: Health Service Management	1. Health Service Management 2. Human Resource Management	50	10	60	4	1
LMP1007	MODULE 7: Laboratory Management and Practice	1. Laboratory Management 2. Laboratory Practice	50	10	60	4	1
MBS 1008	MODULE 8: Mathematics and Bio Statistics	1. Mathematics 2. Biostatistics	60	0	60	4	1
MTR1009	MODULE 9: Medical Terminology	1. Medical Terminology	40	0	40	3	1
RMP 1010	MODULE 10: Research Methods and Projects	1. Research Methods 2. Projects	60	0	60	4	1
SEL 1011	MODULE 11: Social Studies, Medical Ethics, and Law	1. Social Studies 2. Medical Ethics 3. Law	50	0	50	3	1
LSA1012	Module 12: Laboratory Safety	1. Laboratory Safety	50	10	60	4	1

SDS 1013	Module 13: Self-directed Study I	1. Self-directed Study I	50	50	100	6	1
Revision and End of Semester examinations					80		
Sub-Total	First Semester		645	180	905	54	

Year 1, Semester 2, 22 weeks

Code	Module	Units	Lecture Hours	Practical Hours	Total Hours	Credits	Level
MLS 1014	Module 14: Molecular Biology	Introduction to Molecular Biology	30	-	30	4	1
MIC 1014	MODULE 14: Microbiology	1. Microbiology	30	30	60	4	1
CHE 1015	MODULE 15: Analytical Chemistry and Clinical Chemistry	1. Analytical Chemistry 2. Biochemistry	80	40	120	8	1
HEM1016	MODULE 16: Haematology	1. Haematology	60	60	120	8	1
HCY1017	MODULE 17: Histopathology and Cytopathology	1. Histopathology y 2. Cytopathology	40	35	75	5	1
IBT 1018	MODULE 18: Immunohaema tology and	1. Immunohaema tology	60	60	120	8	1

	Blood Transfusion Science	2. Blood Transfusion Science					
PEN1019	Module 19: Medical Parasitology and Entomology	1. Medical Parasitology 2. Medical Entomology	60	60	120	8	1
IVI 1020	Module 20: Immunology and Virology	1. Immunology 2. Virology	40	20	60	4	1
PHE1021	Module 21: Public Health and Epidemiology	1. Public Health 2. Epidemiology	40	35	75	5	1
SDS1022	Module 22: Self-directed Study II	1. Self-directed Study II	25	25	50	4	1
Revision and End of Semester Examinations					80		
Sub-Total	Second Semester		435	365	880	54	
Marking of Year 1 examinations					35		
Year 1 Total hours			1080	545	1820	108	

Year 2, Semester 1, 22 weeks

Code	Module	Units	Lecture/ Practical Hours	Attachme nt Hours	Total Hours	Credits	Level
MLS 2023	MODULE 23: Clinical Microbiology I	1. Clinical Microbiology I	50	50	100	6	2
MLS 2024	MODULE 24: Clinical Chemistry I	1. Clinical Chemistry I	50	50	100	6	2
MLS 2025	MODULE 25: Clinical Haematology I	1. Clinical Haematology I	50	50	100	6	2
MLS 2026	MODULE 26: Clinical Histopathology and Cytopathology I	1. Clinical Histopathology I 2. Clinical Cytopathology I	50	50	100	6	2
MLS 2027	MODULE 27: Clinical Blood Transfusion Science I	1. Clinical Blood Transfusion Science I	50	50	100	6	2
MLS 2028	Module 28: Medical Parasitology & Entomology I	1. Medical Parasitology I 2. Medical Entomol ogy I	50	50	100	6	2
MLS 2029	Module 29: Clinical Immunology and Virology I	1. Clinical Immunology 1 2. Clinical Virology 1	50	50	100	6	2

SDS 2031	Module 30: Self-directed Study III	1. Self-directed Study III	50	50	100	6	2
Revision and End of Semester examinations					80		
Sub-Total	First Semester		400	400	880	48	

Year 2, Semester 2, 22 weeks

Code	Module	Units	Lecture/ Practical Hours	Attachme nt Hours	Total Hours	Credits	Level
MLS2031	MODULE 31: Clinical Microbiology II	1. Clinical Microbiology II Mycology	50	50	100	6	2
MLS2032	MODULE 32: Clinical Chemistry II	1. Clinical Chemistry II	50	50	100	6	2
MLS2033	MODULE 33: Clinical Haematology II	1. Clinical Haematology II	50	50	100	6	2
MLS2034	MODULE 34 Clinical Histopathology and Cytopathology	1. Clinical Histopathology 2. Clinical Cytopathology	50	50	100	6	2
MLS2035	MODULE 35: Clinical Blood Transfusion Science II	1. Clinical Blood Transfusion Science II	50	50	100	6	2
MLS2036	MODULE 36: Medical Parasitology	1. Medical Parasitology II 2. Medical Entomology II	50	50	100	6	2

	and Entomology II						
MLS 2037	Module 37: Clinical in Immunology and Virology II	1. Clinical Immunology II 2. Clinical Virology II	50	50	100	6	2
SDS 2038	Module 38: Self-directed Study IV	1. Self-directed Study IV	50	50	100	6	2
Revision and End of Semester examinations					80		
Sub-Total	Second Semester		400	400	880	48	
Marking of Year 2 Examinations					35		
Year 2 Total hours			800	800	1795	96	

Year 3, Semester 1, 22 weeks

Code	Module	Units	Lecture/ Practical Hours	Attachme nt Hours	Total Hours	Credits	Level
MLS3039	MODULE 39: Clinical Microbiology III	1. Clinical Microbiology III Mycology	50	50	100	6	3
MLS3040	MODULE 40: Clinical Chemistry III	1. Clinical Chemistry III	50	50	100	6	3
MLS3041	MODULE 41: Clinical Haematology III	1. Clinical Haematology III	50	50	100	6	3
MLS3042	MODULE 42 Clinical Histopathology and	1. Clinical Histopathology III	50	50	100	6	3

	Cytopathology III	2. Clinical Cytopathology III					
MLS3043	MODULE 43: Clinical Blood Transfusion Science III	1. Clinical Blood Transfusion Science III	50	50	100	6	3
MLS3044	MODULE 44: Medical Parasitology and Entomology III	1. Medical Parasitology III 2. Medical Entomology III	50	50	100	6	3
MLS 3045	Module 45: Clinical Immunology and Virology III	1. Clinical Immunology III 2. Clinical Virology III	50	50	100	6	3
SDS 3046	Module 46: Self-directed Study V	1. Self-directed Study V	50	50	100	6	3
Revision and End of Semester examinations					80		
Sub-Total	First Semester		400	400	880	48	

Year 3, Semester 2, 22 weeks

Code	Module	Units	Lecture/ Practical Hours	Attachment Hours	Total Hours	Credits	Level
RPR 3047	MODULE 47: Research Project I	1. Research Proposal	180	180	360	10	3
RPR 3048	MODULE 48: Research Project II	1. Final Research Project	220	220	440	10	3

Revision and End of Semester examinations				80		
Sub-Total	Second Semester	400	400	880	20	
Marking of Year 3 examinations				35		
Year 3 Total hours		800	800	1795	68	
Sub-Total Programme	Total hours for lectures/practicals/clinical placements			4825		
Marking of end of year examinations and final qualifying examinations				140		
Total hours for revision and end of semester examinations				480		
Total Programme hours				5445		

10.0 Teaching and Learning Experiences

The course is delivered in the English language and uses educational strategies that focus on student-centered approaches to teaching and learning such as Problem-Based Learning (PBL) and the principles of adult learning. The teaching and learning experiences enable students to acquire knowledge and clinical/practical skills, and develop professional attitudes, values and ethics required in medical laboratory practice.

Various teaching and learning experiences are necessary to cover all areas of clinical and practical skills. These include teaching and learning in hospitals and health centres, classrooms, mortuaries, libraries, and in the community. The following are some of the teaching and learning methods used in the curriculum: lectures, individual and group discussions, role playing, observation, student projects, tutorials, assignments, simulations, practical/clinical attachments, field visits, demonstrations, and self-directed learning.

11.0 Teaching and Learning Resources

The curriculum is implemented by trained and qualified facilitators, most of who are Medical Laboratory Scientists. The facilitators shall be competent in training

methodology. Clinical instructors attached to the laboratory departments in the hospitals will be responsible for the students' practical training. In addition, relevant support staff will assist the facilitators during the training (see appendix 1). Relevant teaching facilities, materials and aids available during training include: health facilities with functional laboratories, access to patients/clients and communities, classrooms, laboratory equipment, laboratory reagents, a museum, overhead projectors (OHPs), transparencies, films, newsprints, marker pens, chalk and board, case study scripts, handouts, specimens and models, training manuals, television/videos, posters/charts, a computer laboratory, reference materials such as textbooks and journals, access to the Internet and library, and a mortuary.

The training of Medical Laboratory Technologists requires a diversity of patients/clients in hospitals and health centres, and in the community setting. It is therefore important that during clinical placements, the training institutions ensure students have access to this diversity and are effectively supervised. In this regard, the institution and the Ministry of Health will identify appropriate supervisors for clinical/practical skills who are motivated and willing to effectively supervise students. Appropriate learning centres with reasonably adequate resources must be available to ensure that students have maximal opportunities for learning.

12.0 Assessment of Students' Performance and Award of the Diploma

Assessment of Medical Laboratory Technologists will be continuous and summative. Continuous Assessment Tests (CATs) will be used to assess and give feedback to teachers and learners throughout the programme. These represent formative assessments. The CATs comprise course work assessments which include a combination of any of the following: end of course written theory assessment, end of course practical assessment, quizzes, written assignments, project work, active participation and attendance. Final Qualifying Examinations form the summative assessment. A Board of Examiners set up by the Ministry of Health consisting of representatives of the Ministry of Health, tutors and administrators of medical laboratory

training institutions will oversee the management and declaration of ALL Final Qualifying Examinations.

12.1 Guidelines for Assessment

a) Continuous Assessments Tests (CATs)

A trainee is expected to attend at least 90% of the teaching and learning sessions in each course and pass the CATs thereof in order to qualify for the summative/final qualifying examination. A trainee shall be expected to attain a 50% passing mark in all courses examined in order to sit for the Final Qualifying Examinations. The CATs carry a weight of **60%**, which include 10% of the project work examination.

Format of examinations

All theory papers at the end of each semester are set out of 100 marks and shall comprise the following objective tests.

- Multiple Choice Questions (MCQs)
- Modified Essay Questions (MEQs)
- Short Answer Questions (SAQs)

b) Summative Assessment/Final Qualifying Examination

The following items shall comprise the Final Qualifying Examination and will be examined according to the time specified:

- Project Work– 60 hours (students are required to conduct a project in any of the eight main disciplines in medical laboratory sciences).
- Eight theory papers – 3 hours each (from the eight main disciplines in medical laboratory sciences).
- Combination of practicum and oral examination - 4 hours and 30 minutes (4 hours for practicum and 30 minutes for orals).

Each theory paper will comprise of two sections (A and B)

Section A: Multiple Choice Questions (40 marks for 40 correct responses).

Section B: Modified Essay Questions and Short Answer Questions. The candidates are expected to choose **three (3)** out of five (5) questions.

The passing mark for each of the assessments will be 50%. The summative assessment comprises **40%** of total 100% percentage of the Final Qualifying Examination.

12.2 Grading system

Performance	Marks	Grade
Excellent	85 and above	A
Very good	75-84	B
Good	65-74	C
Pass	50-64	D
Fail	49 and below	F

12.3 Examination regulations and requirements

a) Continuous Assessments Tests (CATs)

1. A candidate must pass the CATs before he/she is presented for the Final Qualifying Examination.
2. A candidate who fails any course in the CATs is required to do **one** supplementary examination for each course failed at any appropriate period within the semester before proceeding to the next semester.
3. There are end of semester examinations and the passing mark for each subject at the end of semester examination shall be 50%.
4. A candidate who fails the end of semester examinations is required to do a supplementary examination(s). A candidate who fails the supplementary examinations in any course is required to repeat the course in the semester in which the course was undertaken. A candidate who fails **three** supplementary examinations at the end of the year must repeat the year of study. A candidate who fails again in the repeated year must be discontinued on academic grounds.
5. A candidate who fails 50% of the courses in the first semester of year one will be discontinued on academic grounds.

6. A candidate who fails in the clinical/practical placements is required to repeat the placements during the next academic year.

b) Final qualifying examination

- 1) A candidate who fails to attain the marks for the Final Qualifying Examination will be allowed to sit **one** supplementary examination after **three months**. A candidate who fails the supplementary examination will be **required to repeat the year** in accordance with the recommendations of the Board of Examiners. A candidate who fails after repeating one year will be **discontinued**.
- 2) A Board of Examiners established by the MoHsets, vets, moderates and marks the Final Qualifying Examinations and declares the results.
- 3) The Board of Examiners' decision on the results of the Final Qualifying Examination is final and binding.

12.4 Award of the Diploma

Upon successful completion of the programme, the Ministry of Health awards graduates with a **Diploma in Medical Laboratory Sciences**. An Institutional Transcript indicates that the candidate successfully completed and passed all the courses and clinical/practical experiences.

13.0 Programme Implementation and Management

13.1 Programme implementation

During the training period, the courses shown in the programme organisation table under each semester are delivered full-time. The students will attend as day scholars or be accommodated as boarders in the training institutions where the programme is implemented. In addition, the necessary resources and physical infrastructure and clinical and practical placement areas will be assessed for their appropriateness. It is imperative that students with the prerequisite admission requirements are selected and admitted to the programme to achieve successful outcomes. All relevant stakeholders will be involved in the dissemination and implementation of the curriculum.

13.2 Programme management

The programme will be managed by each institution's management system. However, in institutions with more than one programme, there is need to have a coordinator for the Diploma in Medical Laboratory Sciences programme for its smooth implementation. The actual teaching and learning will be managed through the use of study guides (Learners' guides) which are prepared by the teachers facilitating in each course, Teachers' (Trainers') manuals, Standard Operating Procedures for Essential Laboratory Tests booklet and Practical/Log books. Management of assessment in the placement areas shall be by use of Standard Assessment Tools. Whatever the management structure of each institution implementing the programme, each student will be empowered to manage their own learning through the time set aside for self-directed learning in addition to the period set aside for teaching and learning during the semester. The facilitators will guide students on how best to maximise these periods.

The following is a hierarchical flow of the content areas in each semester as delivered during the programme period.

14.0 Course outlines

14.1 Year 1, Semester 1

CHE 1001 Chemistry(4 credits, 60 hours)

Year 1, Semester 1 (Lecture 30 hours; Practical 30 hours)

Instructor information

Course description

This course is designed to offer the learner an introduction to the basic concepts, principles, and applications of general chemistry. A variety of topics will be covered including the chemical combinations, qualitative and quantitative analysis, chromatography, and organic chemistry.

Pre-requisites: High school chemistry or equivalent

Aim

The aim of this course is to enable the learner to demonstrate an understanding of general chemistry concepts, applications, principles, and to acquire analytic skills and knowledge used in biomedical sciences.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Explain the chemical structures and combinations in chemistry
2. Apply qualitative and quantitative tests and procedures used in chemistry
3. Explain the principles and applications of organic chemistry
4. Explain the principles and applications of chromatography
5. Describe matter as an element, mixture, or compound
6. Describe components of atoms
7. Describe Dalton's Atomic Theory

8. Calculate the concentration of solutions
9. Describe trends in the periodic table

Course Content

Chemical combinations

Structure and properties of an atom

- Dalton's Atomic Theory
- Mixtures and compounds
- The Periodic Table
- Chemical equations
- Acids, bases and salts
- Weak and strong acids and bases
- pH scale

Quantitative and qualitative analysis

- Quantitative analysis
- Qualitative analysis
- Titrimetric techniques
- Concentration terms
- Preparation of solutions
- Acid/base indicators (pH)
- Principles and applications of chromatography
- Applicable glassware

Organic chemistry

- Terms used
- Difference between saturated and unsaturated compounds
- Homologous series
- Common uses: alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, carboxylic acids, esters and amines and aromatic compounds
- Chemical bonds; types of bonds; properties of bonds

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Self-directed learning

Readings

Seminars

Assessment strategy

One assignment, one test and a final end of semester examination to assess learner's knowledge of the concepts, principles and applications of general chemistry and the different methods used for analysis.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Books, lecture notes, handouts, trainer's manual, study guides, access to library, laboratory premises, equipment, reagents, chemicals, flip chart holders/charts, chalkboards, transparencies, overhead projectors, computers, LCD and printers.

Required text

Saylor Foundation. General Chemistry: Principles, Patterns, and Applications. [Online]

Available from:

<http://www.saylor.org/site/textbooks/General%20Chemistry%20Principles,%20Patterns,%20and%20Applications.pdf>. [Accessed: 2nd July 2014].

Recommended reading

Lower, S. *Chem1 Virtual Textbook: A reference text for general chemistry*. [Online]

Available from:

<http://www.chem1.com/acad/webtext/virtualtextbook.html>. [Accessed: 2nd July 2014].

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

CLP 1002 Computer Application to Laboratory Practice (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 40 hours; Practical 20 hours)

Instructor information

Course description

This course covers computer principles and applications for use in healthcare, research, and laboratory settings. Learners will receive hands-on training and learn fundamental concepts of computer hardware, software, and various computer and Internet-based applications including email, searching the World Wide Web, word processing, spreadsheets, multiple media presentations, and databases using their own computer or the institution's computer laboratory.

Pre-requisite High school computer class or equivalent

Aim

The aim of this course is to enable the learner to demonstrate an understanding of basic computer concepts, principles, and laboratory applications and to develop technical computer skills and problem-solving skills needed to manage laboratory data and to store and retrieve information.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Describe the basic components of a computer
2. Describe types and classifications of computers
3. State the principles of laboratory information systems and information processing
4. Apply common computer software packages for data collection, data processing, data analysis, and data management
5. Process, manipulate and represent numeric data using spreadsheet software (Excel)
6. Prepare Power Point presentations

7. Apply techniques to prepare and format an Excel worksheet to create formulas and charts
8. Illustrate the basics of data entry using a statistical software program (SPSS)
9. Produce documents using word processing software (Word)
10. Investigate Internet-based applications
11. Apply techniques for electronic messaging
12. Identify computer risks and safety

Content

Introduction to Computers

- Computer components-hardware and software
- Hardware: CPU, input and output devices, file storage devices
- Software: operating system, applications, utilities and drivers
- Application program
- Types: personal computer and microcomputers
- Classification by process: digital, analog, hybrid
- Classification by purpose: main frame, mini, micro (desktop, laptop, palmtops)

Principles of Computer Operating Systems

- Computer environment
- Operating system: MS DOS, MS Windows: 98, 2K, XP, NT, ME, Linus, Unix

Applications

- MS Word, Excel, Access, PowerPoint, Epi, SPSS, Excel

Data Management

- Definitions of data, information, quality control

Use of Computers in Laboratory Management

- Data information management: data entry, data analysis and presentation, data storage, data retrieval
- Access of information
- Production of medical documents
- Laboratory supplies

Teaching and learning strategies

Lectures

Demonstrations

Self-directed learning

Hands - on Training

Observations

Assignments

Assessment strategy

One assignment, one test, and a final examination to assess the learner's knowledge of basic concepts, principles, and applications of computer technologies used in health care, research, and medical laboratory settings.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Lecture notes, handouts, trainer's manual, study guides, computer laboratory, flip chart holders/newsprints, chalkboard, transparencies, LCD projectors, computers, printers, access to Internet and library.

Required text

O'Leary, T.J and O'Leary, L.I. (2007). *Computing Essentials*. Washington, DC: McGraw-Hill Higher Education. ISBN: 978-0-07-351670-7.

Recommended reading

UCLA. *Introduction to SAS*. UCLA: Statistical Consulting Group. [Online] Available from: <http://www.ats.ucla.edu/stat/sas/notes2/>. [Accessed: 5th July 2014].

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

EPE1003 Entrepreneurship Education (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 40 hours; Practical 20 hours)

Instructor information

Course description

This course is designed to offer the learner an opportunity to explore the development process of a business plan including financing, networking, and marketing strategies for creating and managing a business enterprise.

Pre-requisite None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes for entrepreneurship in order to operate and manage a business enterprise.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Demonstrate a positive attitude towards self-employment
2. Describe the factors that affect the success of an enterprise
3. Conduct a feasibility study in accordance with an intended business
4. Manage an enterprise successfully
5. Explore the brainstorming and development process
6. Demonstrate an understanding of financial issues
7. Develop a marketing strategy
8. Develop a complete business plan
9. Understand the law, ethics, and social responsibility of self-employment

Content

Entrepreneurship and Self-Employment

- Importance of self-employment

- Entrepreneurship contribution to national Development

- Requirements for entry into self-employment

Entrepreneurial Opportunities

- Business opportunities
- Assessing product demands
- Matching skills and resources to changing technology

Entrepreneurial Awareness

- Evaluating the business environment
- Types of business finance
- Contractual agreements
- Government policy on small scale enterprises
- Problems of starting and operating a business enterprise

Entrepreneurial Motivation

- Internal motivating factors
- Techniques of self-assessment
- External motivating factors

Entrepreneurial Competencies

- Decision making in business
- Instituting change
- Coping with competition
- Risk taking
- Techniques of time management
- Leadership qualities

Enterprise Management

- Evaluating business goals
- Efficiency of resources utilisation
- Finance planning
- Production management
- Management of human resources

- Work study
- Marketing and public relations
- Information management
- Project planning
- Law, ethics, and social responsibility of self-employment

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Self-directed learning

Readings

Assessment strategy

One assignment, one test and a final end of semester examination to assess the learner's knowledge, skills and attitudes about entrepreneurship.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's notes, handouts, trainer's manual, study guides, access to Internet and library, transparencies, flip chart holders/newsprints, chalkboard, textbooks, computers, LCD projector, and printers.

Required text

Small Business and Entrepreneurship Resources [Online]. Available from:
<http://www.prenhall.com/scarbzim/html/resource.html>. [Accessed: 2nd July 2014].

Recommended reading

Pinkett, R. (2007) *Campus CEO: The Student Entrepreneur's Guide to Launching a Multi-Million-Dollar Business*. Chicago, IL: Kaplan Publishing. ISBN 9781419593710.

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

HAP 1004 Human Anatomy and Physiology (6 credits, 95 hours)

Year 1, Semester 1 (Lecture 80 hours; Practical 15 hours)

Instructor Information

Course description

This course covers basic human anatomy and physiology. Topics include general human body components, cell structure, and function; tissues, glands and membranes, anatomy and functions of the human body systems.

Pre-requisites: High School Anatomy and Physiology course or the equivalent

Aim

The aim of this course is to enable the learner to acquire knowledge needed to demonstrate a clear understanding of the various parts and functions of the human body.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Define human anatomy and physiology
2. List the functions of cells, tissues, organs within the human body systems
3. Describe the structure and functions of the respiratory system
4. Describe the structure and functions of the digestive system
5. Describe the structure and functions of the urinary system
6. Describe the structure and functions of the reproductive system
7. Describe the structure and functions of the circulatory system
8. Describe the structure and functions of the muscular-skeletal system
9. Describe the structure and functions of the endocrine system
10. Describe the structure and functions of the immune system
11. Describe the structure and functions of the nervous system
12. Describe the structure and functions of the skin, hair and nails

Content

Introduction to Anatomy and Physiology

- Definition
- Importance
- Structure and functions of cells, tissues, and organ systems

Circulatory System

- Heart, blood vessels, lymphatic vessels

Reproductive System

- Male: Testes, prostate gland, seminal vesicles, penis
- Female: Ovaries, uterine tubes, uterus, cervix, vagina

Excretory System

- Kidney, urinary tract, skin

Digestive System

- Gastro-intestinal tract, the liver, pancreas, gall bladder

Immune System

- Bone marrow
- Thymus
- Spleen
- Lymph nodes
- Mononuclear phagocytic network

Endocrine System

- Pancreas gland
- Adrenal glands
- Thyroid and parathyroid glands
- Sex glands (ovaries and testes)
- Pituitary gland

Nervous System

- Brain and brain cells
- Cranial nerves
- Peripheral nerves (sensory and motor)

- Autonomic nervous system
- Cerebrospinal fluid

Musculo-skeletal System

- Thorax, head and neck, limbs (lower & upper), abdomen and pelvis

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Demonstrations

Observations

Assignments

Readings

Assessment strategy

One assignment, one test and a final end of semester examination to assess the learner's knowledge of the essential components, structure, and function of the human organs and body systems.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, flip chart holders/charts, LCD projector, textbooks, access to Internet and library, anatomy models, slides, charts, computers and printers.

Required text

Marieb, E.N. and Hoehn, K. (2012) *Anatomy and Physiology*. 9th Ed. [Online] Available from: <http://humananatomy.pdf.wordpress.com>. [Accessed: 7th July 2014].

Recommended reading

Scanlon, V.C. and Sanders, T. (2007) *Essentials of Anatomy and Physiology*. 5th Ed. [Online] Available from http://kepstickma.files.wordpress.com/2011/05/f-a-davis_-_essentials-of-anatomy-and-physiology-2007.pdf. [Accessed: 7th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

LIN 1005 Laboratory Instrumentation (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 45 hours; Practical 15 hours)

Instructor information

Course description

This course covers the principles, procedures, and care of laboratory supplies, equipment, instruments and apparatus needed to equip a routine medical laboratory. Topics include standard operating procedures, maintenance and preventive maintenance, safety, quality assurance, calibration, sterilisation, disinfection, and decontamination.

Pre-requisite: None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills and attitudes needed to appropriately maintain and operate laboratory equipment, instruments, and apparatus.

Learning objectives

Upon completion of this course, the learner will be able to:

1. List essential medical laboratory equipment, instruments, and apparatus
2. Describe general procedures for operating laboratory equipment, instruments, and apparatus
3. Explain the use of basic laboratory materials and instruments needed to equip a routine medical laboratory
4. Describe the procedures for maintaining daily checks, services and decontamination
5. Describe the procedures for installing and calibrating medical laboratory instruments
6. Describe the procedures for maintenance and preventive maintenance of basic medical laboratory equipment

7. Explain basic safety precautions while handling materials and equipment in a medical laboratory
8. Explain the importance of following standard operating procedures (SOPs)
9. Explain the procedures for sterilisation and disinfection
10. Explain trouble shooting procedures
11. Explain the importance of following quality assurance methods

Content

Laboratory Instruments

- Flame photometers, light and fluorescent microscopes, tissue processors, microtomes, ovens, knife sharpeners, photometers, glucometers, fluorimeters, pH meters, electrophoresis systems, chromatographic systems, incubators, centrifuges, refrigerators and freezers, balances, stills, deionisers, filters, incinerators, autoclaves, embedding machines, cryostats, auto-analysers, rollers, urinometers, mixers, bio-safety cabinets, fans, PCR machines, flow cytometers, haematology and chemistry analysers

Laboratory Apparatus

- Dilutors, dispensers, laboratory ware (including glassware), integral syringes, strops, dissecting kits, plasma extractors, Bunsen burners, spirit lamps, Elisa screening test systems

Instrument Installation

- Size of instruments in relation to weight, stability, voltage, environmental conditions, ventilation, and security issues

Operating Principles

- Standard operating procedures (SOPs) for all laboratory instruments listed
- Use of standards and controls
- Qualitative, semi quantitative and quantitative quality control
- External Quality Assurance

Maintenance and preventive maintenance

- Follow instrument manufacturer's guidelines

- Trouble shooting

Maintenance and Decontamination

- Dusting, covering, cleaning of instruments,
- Daily checks, trouble shooting, dealer servicing including service contracts, replacing bulbs and fuses, cleaning, drying, disinfectants, antiseptics, sterilisation

Calibration of Laboratory Instruments

- Colorimeters, Haemoglobinometers
- Weighing balances
- Pipettes

Equipment Validation and verification

- Verification/validation protocol
- Verification/validation parameters
- Verification/validation reporting

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Self-directed learning

Observations

Assignments

Readings

Assessment strategy

One assignment, one test, and a final end of semester examination to assess the learner's knowledge of the principles, procedures, and applications needed to appropriately maintain laboratory instruments in a medical laboratory.

Assessment patterns

Assignment 30%
CAT 30%
Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, flip chart holders/newsprints, LCD projector, textbooks, handouts, and laboratory equipment, apparatus and instruments, access to the Internet and library.

Required text

Hong, C. (2010) *Clinical Laboratory Instrumentation*. [Online] Available from: https://courses.washington.edu/bioen302/Lecture/302Lect_LabInstrumentation.pdf. [Accessed: 7th July 2014].

Recommended reading

World Health Organization (2003) *Manual of Basic Techniques for a Health Laboratory*. [Online] Available from: <http://apps.who.int/medicinedocs/documents/s16537e/s16537e.pdf>. [Accessed: 7th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

HSM 1006 Health Service Management (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 50 hours; Practical 10 hours)

Instructor information

Course description

This course focuses on the role of leadership and the strategic planning process for initiating and managing health care facilities and health training institutions. Topics covered include concepts, principles, and theories of leadership and management, management functions, quality assurance, human resource management, financial and material resource management.

Pre-requisites: None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes needed for effective management of health care facilities and health training institutions.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Describe various principles and theories of management that apply to the management of health care facilities and health training institutions
2. Describe the concepts of leadership and management
3. Describe management functions
4. Describe quality assurance as it applies to health care practices
5. Formulate a human resources development plan within and outside the organisation
6. Demonstrate an understanding of financial and material resource management principles and procedures in health service organisations and training institutions
7. Demonstrate an understanding of managing change
8. Demonstrate an understanding of conflict and crisis management

9. Demonstrate clear understanding of communication skills

Content

Management Functions

- Planning
 - Process of planning
 - Importance of planning
 - Techniques used in planning
 - Strategic planning
- Organising
 - Basis of organising activities
- Implementing
- Resources
- Leadership
- Supervision
- Directing
- Monitoring
- Motivation
- Coordinating
- Communicating
- Collaborating
- Directing
- Monitoring
- Evaluating
- Supervising
- Motivating
- Controlling
- Leadership
- Role of manager in directing organisational activities
 - Overview of management

- Principles of management
- Role of managers in organisations
- Process of management
- Importance of management in organisation
- Techniques of Coordination
 - Process of coordination
 - Role of manager in directing organisational activities
 - Techniques used in coordination
- Human Resource Management
- Structuring the system (analysing and designing jobs)
- Recruitment selection, placement, internal mobility
- Separations, death, retirement or resignation
- Performance appraisal
- Preparing for advancement
- Management of Change and Conflicts
- Factors influencing organisational change
- Causes of resistance to change
- How to overcome employee resistance to change
- Techniques of managing change
- Techniques of Management
- Meaning of conflicts
- Advantages and disadvantages of conflicts in an organisation
- Techniques of managing conflicts
- Stress Management
 - Meaning of stress
 - Causes of stress
 - Techniques of managing stress
- Techniques of Organisational Control
 - Types of control systems
 - Importance of control systems

- Control techniques
- Communication Skills
 - Definitions
 - Types and modes of Communication
 - Importance of effective communication

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Readings

Observations

Demonstrations

Assignments

Assessment strategy

One assignment, one test, and a final end of semester examination to assess the learner's knowledge of the concepts, principles, and practices of health service management.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, access to Internet and library, handouts, textbooks, flip chart holders/charts, LCD projector, printers and computers.

Required text

Boo yens, S.W. (2008) *Introduction to health services management*. 3rd Ed. Cape Town, ZA: JuxtaAcademic.

Recommended reading

Itika, J. (2011) *Fundamentals of Human Resource Management: Emerging Experiences from Africa*. [Online] Available from:
<https://openaccess.leidenuniv.nl/handle/1887/22381>. [Accessed: 8th July 2014].

World Health Organization. (2006). *Quality of Care: A Process for Making Strategic Choices in Health Systems*. [Online] Available from:
http://apps.who.int/iris/bitstream/10665/43470/1/9241563249_eng.pdf?ua=1.
[Accessed: 8th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

LMP 1007 Laboratory Management and Practice (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 50 hours; Practical 10 hours)

Instructor information

Course description

This course focuses on the basic principles, procedures, and applications of quality laboratory management. Topics covered include laboratory design, laboratory safety, management styles, strategic planning and forecasting, stress and conflict management, sanitation, decision-making strategies, ethics, communication, laboratory practice and regulations, managing equipment, record keeping, inventory control, and laboratory information systems.

Pre-requisite: None

Aim

The aim of this course is to enable the learner to acquire basic knowledge, skills, and attitudes needed to effectively manage a medical laboratory.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Effectively manage medical laboratory resources
2. Effectively manage change and conflict
3. Effectively manage stressful issues at the work place
4. Demonstrate effective communication skills
5. Apply the principles and practices of ethics and quality laboratory management
6. Administer appropriate first aid procedures
7. Demonstrate effective organisation and management of laboratory staff

Content

- Laboratory Management: Principles, Procedures, and Practices

- Leadership and management
- Role of laboratory supervisors, managers, and directors
- Principles, qualities, and types of leadership
- Laboratory design
- Management Styles
 - Management by Objectives
 - Management by exceptions
 - Crisis management
- Strategic Planning and Forecasting
 - Planning and conducting interviews and meetings
 - Principles of Organising
 - Structure
 - Relationships
 - Delegation
- Controlling
 - Importance and span of control
 - Control systems and techniques
- Staffing
 - Job descriptions
 - Recruitment, placement, retention, upward mobility
 - Separation, death, retirement, or resignation
 - Performance appraisal and competency assessment
 - Process and Techniques of coordination
 - Personnel files
- Process and Types of Motivation
 - Factors influencing motivation
 - De-motivation
- Managing Organisational Change and Conflicts
 - Factors influencing organisational change
 - Resistance and counter-resistance to change
 - Meaning and causes of conflicts

- Advantages and disadvantages of conflicts
- Stress Management
 - Definition and common causes of stress
 - Techniques used to manage stress
- Purpose and Process of Effective Communication
 - Informal and formal communications
 - Creating and distributing written reports
 - External and mass media communications
- Laboratory Equipment, Classification and Regulations
 - Selection and Procurement of Laboratory Equipment
 - Maintenance and preventive maintenance of laboratory equipment
- Recording Keeping and Supplies
 - Storage and security
 - Purchasing and receiving
 - Control of stock levels
 - Protection of laboratory records
 - Methods of storing retrieving, and protecting materials and documents
- Definition, Aims, and Roles of First Aid
 - Assessment of accident situations
 - Clinical conditions requiring first aid
 - First aid box
 - Ethics in first aid
 - Demonstrations of first aid

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Self-directed learning

Assignments

Readings

Assessment strategy

One assignment, one test, and a final end of semester examination to assess the learner's knowledge of quality laboratory management and laboratory practice.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, textbooks, handouts, flip chart holders/charts, laboratory equipment/apparatus and instruments, overhead projectors, printers, computers, first aid kit, access to the Internet and library.

Required text

Harmening, D.M. (ed.) (2013) *Laboratory Management: Principles and Processes*. 3rd Ed. St. Petersburg, FL: D. H. Publishing & Consulting, Inc.

Recommended reading

WHO (2003) *Manual of Basic Techniques for a Health Laboratory*. [Online] Available from: <http://apps.who.int/medicinedocs/documents/s16537e/s16537e.pdf>. [Accessed: 7th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

MBS 1008 Mathematics and Biostatistics (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 60 hours)

Instructor information

Course description

This course is designed to introduce the basic concepts and principles of mathematics and biostatistics and their application in the medical laboratory. Topics include algebraic and quadratic equations, graphing and charting of data, calculus, collection, correlation, analysing, presentation, and dissemination of data in biomedical laboratory sciences.

Pre-requisites: High School mathematics and statistics or the equivalent

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes needed to apply mathematics and biostatistics methods to laboratory practice.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Apply mathematical expressions in medical laboratory sciences
2. Apply statistical methods to collect, analyse, and present data
3. Correctly analyse and interpret statistical data
4. Apply basic principles, methods, and applications of biostatistics in biomedical laboratory science

Content

Algebraic and Quadratic Equations

- Decimals
- Fractions
- Rounding

- Standard form
- Algebraic expressions
- Equations – linear, simultaneous, quadratic
- Indices and logarithms
- Exponential and logarithmic equations

Linear and Non-linear Graphs

- Straight line graphs
- Curves
- Exponential curves
- Deduction of laws to linear form
- Gradients
- Intercepts

Ratios

- Proportion /variation
- Inverse, direct, partial & joint
- Percentage

Money

- Interest
- Simple interest
- Compound interest

Mensuration

- Systems (imperial and metric)
- Inter-conversions of units
- Areas, volume, pressure, time

Calculus

- Introduction to differentiation
- Introduction to integration
- Applications of differentiation and integration

Biostatistics

- Statistical measures

- Mean, Median, Mode, variance, and Standard deviation
- Student t-test, Chi square, ANOVA, Correlation statistics

Data management

- Collection of data
- Organisation of data
- Representation of data
- Tabulations
- Interpretation of data

Probability

- Classical definition
- Axiomatic definition

Teaching and learning strategies

Lectures

Small group discussions

Presentations

Self-directed learning

Readings

Demonstrations

Observations

Assignments

Assessment strategy

One assignment, one test, and a final end of semester examination to assess the learner's knowledge of the principles and applications of mathematic and biostatistical methods used in the medical laboratory.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, handouts, flip chart holders/newsprints, Overhead projector, charts, access to Internet and library, LCD projector, computers and printers.

Required texts

Doucette, L. J. (2011) *Mathematics for the Clinical Laboratory*. 2nd Ed. Maryland Heights, MO: Saunders/Elsevier.

Recommended reading

Illowsky, B., and Dean, S. (2012, July 3) *Collaborative Statistics*. [Online] Available from: <http://cnx.org/content/col10522/1.40/>. [Accessed: 7th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

MTR 1009 Medical Terminology (3 credits, 40 hours)

Year 1, Semester 1 (Lecture 40 hours)

Instructor information

Course description

This course is designed to provide the learner with knowledge and skills in medical terminology used in the health sciences. The course focuses on the origin, meaning, and structure of commonly used medical terms used in the health sciences. Topics covered include the Greek alphabet, prefixes, suffixes, word roots, plurals, abbreviations, symbols, spellings, and pronunciation of common terms.

Pre-requisites: None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes in medical terminology needed for professional communication in the medical laboratory and healthcare setting.

Learning objectives

Upon completion of this course, the learner will be able to:

1. List commonly used medical terms and words
2. Discuss the meaning of these words
3. Describe the Greek alphabet
4. Discuss the use and applicability of these terms and words in the healthcare setting
5. Relate the medical terms to the structure and function of the whole human body

Content

Common Medical Terms

- Qualities of medical language

- Principles of derivation (e.g. words from Latin and Greek)

Word Roots, Prefixes, and Suffixes

- Coming forms
- Compound words (Greek and Latin)
- Anatomical synonyms

Greek alphabet

Key Medical Terms

Words pertaining to:

- Resemblance
- Cavities
- Deficiencies
- Excess numbers
- Difficulties
- Ease
- Paired & unpaired
- Measurement & size
- Shapes
- Softness, hardness & thickness
- Sensation, feeling and affection
- Growth and reproduction
- Goodness & badness
- Colour
- Movement and transport
- Medical entomological terms
- Air and breath
- Form and sharpness
- Thickness and weight
- Surface identity relations
- Age
- Positions and relative arrangements and distributions

- Approximation and separation
- Visibility
- Temperature
- Time
- Nutrition, digestion and excretions
- Special service, cutaneous sensation
- Mental states construction
- Destruction and obstruction
- Protection
- Wasting, decay, and death
- Description and use of the alphabet

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Demonstrations

Observations

Assignments

Readings

Assessment strategy

One assignment, one test and a final end of semester examination to assess the learner's knowledge of the concepts, principles, and applications of medical terms applicable to biomedical laboratory sciences and health sciences.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, handouts, flip chart holders/charts, overhead projectors, LCD, screen, printers and computers, textbooks, access to the Internet and library.

Required text

Cohen, B. J. (2013) *Medical Terminology: An illustrated guide*. 7th Ed. Philadelphia, PA: Lippincott, Williams, and Wilkins. ISBN 978-1451187564

Recommended reading

The Heritage Medical Dictionary. *Medical Dictionary*. [Online] Available from: <http://dictionary.reference.com/medical>. [Accessed: 7th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

RMP1010: Research Methods and Projects (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 60 hours)

Instructor information

Course description

This course provides learners with the opportunity to demonstrate working knowledge, skills, and attitudes in scientific research, method assessment, and proposal development. Topics include defining the research question, conducting a literature search, developing a proposal, reviewing the Institutional Review Board approval process, and selecting appropriate statistical methods for data analysis.

Prerequisites: Mathematics and Biostatistics course

Aim

The aim of this course is to enable the learners to acquire knowledge, skills and attitudes to successfully complete a scientific research proposal.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Demonstrate an understanding of ethical principles and scientific methods
2. Apply ethical principles and scientific methods to a research investigations
3. Compose a research question and hypothesis of an experimental study
4. Utilise appropriate statistical tools to test the hypothesis of an experimental study
5. Prepare a research proposal aligned with the format of scientific journals
6. Review the Institutional Review Board (IRB) approval process
7. Present a proposal in a structured format

Content

Introduction to Research

- Objectives, research questions, hypotheses, justification, literature review
- Ethical considerations
- Selection of a project

Population and Sampling

- Study population
- Sample size
- Methods of research: experimental, survey, descriptive
- Types of sampling: probability and non-probability
- Sampling frame: Significance of sampling

Data Collection and Analysis

- Data organisation
- Tools used, observational methods, interviews and questionnaires.
- Measurements: qualitative, quantitative, and mixed methods, normal distribution, students T tests

Theoretical framework

Data Collection and Data Storage

Research Proposal Development

- Development of proposal
- Conducting a study
- Reporting
- Layout of proposal: introduction, literature review, objectives, research questions, hypothesis, justification
- Methods: study area, study population, study design, sample size, study technique, data management
- Results, discussion, conclusions, and recommendations
- Dissemination

Institutional Review Board approval process

Teaching and learning strategies

Lectures

Small group discussions

Assignments

Demonstrations

Observations

Self-directed learning

Readings

Assessment strategy

Two assignments, two tests and a research proposal to assess learner's knowledge of the concepts, principles, and applications of scientific method, research ethics, proposal writing and publication.

Assessment patterns

Assignments 30%

Tests 30%

Proposal 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, textbooks, handouts, flip chart holders/charts, overhead projector, LCD projector, computers and printers, access to Internet and library.

Required text

Kumar, R. (2010) *Research Methodology: A Step-by-Step Guide for Beginners*. 3rd Ed. London: Sage Publications. ISBN 978-1-84920-301-2

Recommended reading

Bradford University School of Management. *An Introduction to Research & Research Methods* [Online] Available from:

<http://www.brad.ac.uk/management/media/management/els/Introduction-to-Research-and-Research-Methods.pdf>. [Accessed: 7th July 2014].

Harvard Reference Style Guide

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

SEL 1011 Social Studies, Medical Ethics and Law (3 credits, 50 hours)

Year 1, Semester 1 (Lecture 50 hours)

Instructor information

Course description

This course offers the learners an opportunity to demonstrate an understanding of social studies, professional ethics, Republic of South Sudan Public Health Act, the Medical Laboratory Technicians and Technologists Act, Constitution of the Association of South Sudan Medical Laboratory Professionals and Medical Laboratory Regulatory act.

Pre-requisites: None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes needed to serve as a professional role model in the work place and in society.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Demonstrate an understanding of proper social, professional, and ethical behavior in society
2. Comply the provisions of the Medical Laboratory Technicians and Technologists Act
3. Comply with the provisions of the Republic of South Sudan Public Health Act pertaining to the medical laboratory profession
4. Demonstrate an understanding of the role of civic responsibility
5. Apply government laws relevant to the medical laboratory profession

Content

Social Studies

- Medical sociology
- Medical psychology
- Social economics
- Government
- National philosophy
- Science, technology and religion
- Personal and interpersonal relationships

Personal, Professional and Medical Ethics

- Meaning and importance
- Significance of social and individual values
- Constitution of the Association of South Sudan Medical Laboratory Professionals
- Technology and religion

Law

- Definition
- Importance of law
- Sources of laws
- Public Health Act
- Medical Laboratory Technicians and Technologists Act
- Registration and licensing
- Law in the day to day life of an individual
- Law of contracts
- Law of torts
- Family law
- Land, real property, and laws of basic interest

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning
Demonstrations
Observations
Assignments
Readings

Assessment strategy

One assignment, one test, and a final end of semester examination to assess the learner's knowledge of the concepts, principles, and applications of social studies, medical and professional ethics, general South Sudan laws, and laws relevant to the medical laboratory profession.

Assessment patterns

Assignment 30%
CAT 30%
Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, access to Internet and library, handouts, textbooks, flip chart holders/charts, copies of the Public Health Act and other relevant government laws, computers, printers, and LCD projector.

Required text

Hall, M.A., Ellman, I.M. and Orentlicher (2013) *Health Care Law and Ethics*. St Paul, MN: West Academic. ISBN 9780314209870

Recommended reading

Republic of South Sudan Public Health Act
Constitution of Association of South Sudan Medical Laboratory Professionals
Republic of South Sudan Medical Laboratory Technicians and Technologists Act

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

LSA 1012 Laboratory Safety (4 credits, 60 hours)

Year 1, Semester 1 (Lecture 50 hours; Practical 10 hours)

Instructor Information

Course description

This course is an introduction to laboratory safety, safety regulations, and the safe handling and disposal of chemical, biological, and radioactive supplies and equipment in medical and research laboratories. Topics covered include laboratory risk assessment, fire safety, appropriate sterilisation, disinfection and decontamination methods, management of biological, radiological or chemical spills, and waste management.

Pre-requisites: None

Aim

The aim of this course is to enable the learner to demonstrate knowledge of safety regulations, skills, and attitudes needed to conduct safe laboratory techniques and waste disposal practices in the medical laboratory and research settings.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Demonstrate working knowledge of safe laboratory practices and biohazardous waste disposal
2. Identify the basic concepts of laboratory risk identification and safety surveillance in all areas of the laboratory
3. Complete incident reports for evacuations, accidents and spills in the laboratory
4. Perform safe laboratory practices and biohazardous waste disposal
5. Demonstrate working knowledge of fire safety and safety documents in the laboratory
6. Apply applicable safety regulations in the laboratory

7. Apply principles of safety and risk management in the laboratory
8. Apply safe techniques in biosafety monitoring and biohazardous waste disposal
9. Demonstrate working knowledge of Material Data Safety Sheets
10. Describe Personal Protective Equipment and staff safety

Content

Common Laboratory Safety Terms

- Sterilisation, germicides, disinfectants, bactericides, antiseptics, fungicides, bacteriostats, decontamination, waste disposal
- Laboratory Practice
 - Laboratory design and workflow
 - Sample management
 - Safety Precautions
 - Sources, protection, and prevention of laboratory accidents
 - Use of personal and protective equipment (PPEs)
 - Handling, storage, and disposal of chemicals, biological and infectious materials
 - Handling procedures for fires, explosions, gas cylinders, electricity, radiation
 - Potential sources of injuries
 - Carcinogenic substances, poisons, corrosives, volatile chemicals, radioactive materials, explosives, fumes)
 - Lab equipment (Mechanical, electric, thermal, insulation, voltage)
 - Laboratory apparatus (Breakage, sharps, mechanical)
 - Potential Sources of infection
 - Laboratory hazards
 - Spill Management

Risk management

Incident/Occurrence management

Material Data Safety Sheets

Universal precautions

Staff vaccination and Post Exposure Prophylaxis (PEP)

Teaching and learning strategies

Lectures

Demonstrations

Observations

Assignments

Readings

Assessment strategy

One assignment, one test and a final end of semester examination to assess the learner's knowledge of the concepts, principles and applications of safety regulations in the medical laboratory and research settings.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, access to Internet and library, handouts, textbooks, disinfectants, flip chart holders/charts, overhead projects, transparencies, safety education and training materials, LCD projector, printers and computers.

Required text

CDC and National Institutes of Health (2009) *Biosafety in Microbiological and Biomedical Laboratories*. 5th Ed. [Online] Available from:

<http://www.cdc.gov/biosafety/publications/bmb15/BMBL.pdf>.

[Accessed: 2nd July 2014].

Recommended reading

Occupational Safety and Health Administration. *Occupational Exposure to Hazardous Chemicals in Laboratories* [Online] Available from:

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10106. [Accessed: 2nd July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

SDS 1013 Self-Directed Study I (6 credits, 100 hours)

Year 1, Semester 1 (Lecture 50 hours; Practical 50 hours)

Instructor information

Course description

This course provides the learners an opportunity to independently explore a special biomedical science topic of interest, under the advisement of the instructor who will monitor and critique the learner's progress. The course may be taken for 1 to 6 credits, with department approval. The course may be repeated for credit with a change of topic.

Pre-requisites: A qualified tutor to act as course instructor. Instructor approval

Aim

The aim of this course is to enable the learner to acquire working knowledge and research skills in the exploration of a specific biomedical science topic of interest to the learner.

Learning objectives

Since this is self-directed study, there must be agreement between the learner and instructor as to the learning objectives and the final product. The study must be completed in the semester taken.

Teaching and learning strategy

Self-directed learning

Assessment strategy

To be determined by the instructor

Assessment patterns

To be determined by the instructor

Teaching and learning resources

Access to the Internet and library, handouts, LCD projector, overhead projector, computers and printers.

Required text

Backer, J.R. and Brizee, A. (Eds.) (2013) *Writing a Research Paper* [Online] Available from: <https://owl.english.purdue.edu/owl/resource/658/01/>. [Accessed: 2nd July 2014].

Recommended reading

HARVARD Reference Style Guide

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

14.1 Introduction to Molecular Biology

Year 1, Semester 2 (Lecture 30 hours)

Instructor information

Course description

This course provides learners with the opportunity to demonstrate working knowledge and understanding of molecular biology as it relates to medical laboratory practice. Topics include the basic components of different cells in the human body, parasites, bacteria and viruses, antigen-antibody reactions, principles of molecular biology as they relate to diagnostic testing systems, and examples of diagnostic testing systems that use molecular biology as the basis of reactions.

Prerequisites: None

Aim

The aim of this course is to enable the learners to acquire knowledge to fully understand the role of molecular biology in laboratory diagnostic testing systems.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Define molecular biology as a science
2. Demonstrate an understanding of the basic molecular components of cells
3. Demonstrate an understanding antigen antibody reactions
4. Demonstrate an understanding of the use of molecular biology techniques in laboratory diagnostic systems, including indicator systems
5. Understand current laboratory diagnostic equipment that utilises molecular biological techniques, and their basic principles

Content

Definition of molecular biology

Introduction to cellular structures at molecular level

- Cell membranes
- Cellular contents
- Nuclei
- Proteins and enzymes

Antigen-antibody reactions at molecular level

- Antigens and antibodies
- Antigen and antibody reactions and complexes
- Indicator systems for qualitative testing of antigen-antibody reactions
- Ways of quantitating antigen antibody reactions

Introduction to diagnostic systems based on molecular level reactions

- Advantages and disadvantages of molecular level testing
- PCR – conventional and real time
- Gel electrophoresis
- Molecular cloning
- Macromolecule blotting and probing
- Rapid diagnostic tests
- Commercially available kits vs homemade reagents
- Principles of different types of equipment used for molecular level testing
- Quantitation using molecular methods
- Special requirements for molecular level testing
- Quality assurance for molecular methods

Teaching and learning strategies

Lectures

Small group discussions

Assignments

Observations

Self-directed learning

Readings

Assessment strategy

One assignment, one test and one final end of semester examination to assess the learner's knowledge of the concepts, principles, and applications of molecular biology to biomedical laboratory sciences and health sciences.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, textbooks, handouts, flip chart holders/charts, overhead projector, LCD projector, computers and printers, access to Internet and library.

Required text

Keith Roberts, Martin Raff, Bruce Alberts, Peter Walter, Julian Lewis and Alexander Johnson(2002), *Molecular Biology of the Cell*. 4th Edition, Routledge,ISBN 0-8153-3218-1Harvey Lodish, Matthew P. Scott, Paul T. Matsudaira, Arnold Berk, Chris A. Kaiser, Monty Krieger, Lawrence Zipursky, James E. Darnell. (1995). 4th Edition.W. H. Freeman. ISBN13: 9780716743668

Recommended reading

Albert L. Lehninger, David L. Nelson, Michael M. Cox (1970)Lehninger Principles of Biochemistry. 1st Edition. W. H. Freeman. ISBN13: 9780716743392

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

14.2 Year 1, Semester 2

MIC 1014 Microbiology (4 credits, 60 hours)

Year 1, Semester 2 (Lecture 30 hours; practical 30 hours)

Instructor information

Course description

This is an introductory course in microbiology that focuses on the basic concepts, principles, terminologies, classification, and investigation of microorganisms. Topics covered include structural functions, morphology, and biomedical characteristics of microorganisms, microbial growth, reproduction, nutrition, and body defenses against microbial invasion.

Pre-requisites: High School Biology

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes needed for optimal performance of entry-level work in a routine microbiology laboratory.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Define the basic concepts and principles of microbiology
2. Classify microorganisms of medical importance
3. Discuss body defence mechanisms (non- specific and specific mechanisms)
4. Apply safety precautions in the microbiology teaching laboratory
5. Apply the aseptic technique method used during specimen collection and processing
6. Prepare bacteriological stains
7. Microscopically read and identify bacteria by morphology or stain reaction
8. Discuss the relationship between microbial growth, reproduction, and nutrition
9. Explain how an infection may lead to disease and propagation of the disease

Course content

Microbiology concepts and principles

Definition, nomenclature, and classification of microorganisms

Characteristics of microorganisms

Universal precautions

Laboratory acquired infections

Laboratory safety

- Safety techniques in a microbiology laboratory

Sterilisation

- Sterilisation methods
- Disinfection

Specimen: Urine, stool& rectal swabs, sputum, pus swabs, cerebrospinal fluid, blood, skin scrapings, hair, nail, aspirates, exudates (pleural, peritoneal, synovial, lymph gland fluid)

- Collection
- Transportation
- Preservation
- Processing

Staining, examination, and reporting of microorganisms

Use of molecular diagnostic systems in microbiology including

- Rapid diagnostic tests
- Elisa systems
- Use of test kits
- PCR
- Testing for antimicrobial drug resistance

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Assignments
Practical exercises
Self-directed learning
Readings

Assessment strategy

Two assignments, three tests, and one final assessment to evaluate the learner's working skills, attitude, and knowledge of microbiology.

Assessment patterns

CAT	60%
Final Assessment	40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, standard operating procedures (SOPs), handouts, flip chart holders/Newsprints, overhead projectors, transparencies, charts, access to the Internet and library, teaching laboratory, equipment/apparatus and instruments, specimens, stains and reagents, staining charts, computers and printers and LCD projector.

Required text

Alcamo, E. (2001) *Fundamentals of Microbiology*. 6th Ed. Boston, MA: Jones and Bartlett Publishers. ISBN: 0-7637-1067-9

Recommended reading

Todar, K. (n.d.) *Online Textbook of Bacteriology*. [Online] Available from: <http://www.textbookofbacteriology.net>. [Accessed: 2nd July 2014].

Grading

Marks	Letter Grade
85 & above	A

75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

CHE 1015 Analytical Chemistry and Biochemistry (8 credits, 120 hours)

Year 1, Semester 2 (Lecture 80 hours; Practical 40 hours)

Instructor information

Course description

This course provides the learner with the fundamentals of analytical chemistry and biochemistry. Topics covered include qualitative and quantitative analysis, atoms, elements, and compounds; organic chemistry; physical and chemical changes; chromatography, and organic chemistry, mixtures, chemical combinations, acid, bases, and salts.

Pre-requisites: Basic Chemistry course or equivalent

Aim

The aim of this course is to enable the learner to demonstrate an understanding of the biological effects of biochemical compounds and importance of metabolic processes involved in the functioning of the human body.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Apply the principles of biochemistry to identify biological disorders
2. Demonstrate an understanding of physiology and pathology of organs and their functions
3. Explain the functions of proteins, lipids, nucleic acids, hormones, vitamins, and carbohydrates
4. Apply the knowledge of biochemistry to the functioning of the human body
5. Identify the biochemical compounds of the human body
6. Apply the principles of qualitative and quantitative analysis for use in the medical laboratory

7. Perform analytical procedures and biochemical techniques for the laboratory diagnosis of biological disorders

Course content

Introduction to Biochemistry

- Definition of Biochemistry
- Biochemistry of amino acids and proteins, carbohydrates, lipids, vitamins, enzymes, nucleoproteins, nucleic acids, porphyrins, bile pigments

Physiology and Pathology of organs

- Kidney, liver, pancreas, stomach & intestines, lungs, heart, brain & spinal cord, skin (hair & nails), spleen, lymph glands

Function tests associated with organs

- Liver Function Tests
- Renal Function Tests
- Lipid profile
- Thyroid Function Tests

Collection and Storage of Chemicals and Reagents

- Containers
- Mode of collection
- Types of specimens (blood, urine, stool & rectal swabs, CSF, aspirates, exudates, lymph gland, gastric juice)

Analytical Instruments

- Operation, maintenance, and preventive maintenance

Apparatus

- Chromatography, volumetric analysis, gravimetry, electrophoresis, electrochemistry, radioactivity

Principles and Application of Instruments

- Photometer
- Fluorimeter
- Auto analysers- Flow chemistry

- Perform quality controls
- Calibration of analytical equipment
- Quality assurance

Safety

- Prevention of accidents
- Reporting of incidents and accidents
- Personal protective equipment
- First aid techniques

Diagnostic Biochemical Techniques

Quantitative and Qualitative Analysis

Use of molecular diagnostic systems in clinical chemistry including

- Rapid diagnostic tests
- Elisa systems
- Use of test kits
- PCR

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Assignments

Demonstrations

Readings

Practical Assessments

Assessment strategy

One assignment, one test and one final end of semester examination to assess the learner's knowledge of the concepts, principles and applications of analytic chemistry and biochemistry methods used in a chemistry laboratory.

Assessment patterns

Assignment 30%
CAT 30%
Final Exam 40%

Teaching and learning resources

Lecture notes, handouts, trainer's manual, study guides, access to the Internet and library, textbooks, laboratory premises, equipment, apparatus, and reagents, flip chart holders/charts, computers, printers, and books.

Required text

Devlin, T. M. (2010) *Textbook of Biochemistry with Clinical Correlations*. Hoboken, NJ: John Wiley & Sons.

Harris, D. C. (2006) *Quantitative Chemical Analysis*. 8th Ed. United Kingdom: W. H. Freeman and Company. ISBN 9781429218153

Recommended reading

Biochemical Journal [Online] Available from: <http://www.biochemj.org/bj/default.htm>. [Accessed: 8th July 2014].

International Journal of Analytical Chemistry. [Online] Available from: <http://www.hindawi.com/journals/ijac/>. [Accessed: 8th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

HEM 1016 Haematology (8 credits, 120 hours)

Year 1, Semester 2 (Lecture 60 hours; Practical 60 hours)

Instructor information

Course description

This course provides the learner with the basic principles and applications of routine haematology laboratory investigations. Topics covered include haematopoiesis, routine haematology tests, blood components, haemolysis, common haematological disorders, routine stains for haematological tests, blood collection and processing of blood specimens.

Pre-requisites:None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes needed for optimal performance and supervision of personnel in a haematology laboratory.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Describe the composition and formation of blood
2. Describe haematopoiesis
3. Describe the morphology of blood cells
4. Describe the functions of each blood component
5. Collect blood samples for haematological investigations
6. Prepare and store reagents and stains for use in a haematology laboratory
7. Perform routine haematology tests accurately
8. Investigate the common types and causes of anaemia
9. Perform appropriate tests for haemostatic disorders

Course content

Introduction to Haematology

- Definition: importance and functions
- Blood composition
- Erythrocytes
- Leucocytes (Neutrophils, Monocytes, Lymphocytes, Eosinophils, Basophils)
- Thrombocytes
- Plasma and serum

Haematopoiesis

Sites of blood formation

- Intra uterine (foetal)
- Post uterine (after birth)
- Extra-medullary (myeloid metaplasia)

Development of blood cells

- Origin
- Steps of Blood formation (Erythropoiesis, Leucopoiesis, Thrombopoiesis)
- Haemoglobin
- Synthesis and Types

Cell Morphology and Functions of Blood Components

- Erythrocytes (Red blood cells), Leucocytes (white blood cells), Thrombocytes (Platelets)
- Plasma cells
- Abnormal and immature blood cells

Blood Samples:

- Anticoagulants
- Blood collection containers
- Capillary and Venous blood collection
- Blood films and uses (Thin and Thick film)

Bone marrow

Principles, Preparation and Use of Haematological Stains and Reagents

- Romanowsky stains
 - Leishman stain
 - Jenner's stain
 - Wright's stain
 - May Grunwald
 - Giemsa stain
 - Field's stain

Supravital Stains

Reagents

- Blood cell diluting fluids for WBC, RBC and Platelets
- Drabkin's solution
- Alkaline and acid haematin

Routine Haematology Tests

Blood cell count (manual and automated)

- Erythrocytes, Leucocytes, Thrombocytes
- Leucocyte differential count
- Reticulocyte count
- Packed Cell Volume (PCV)
 - Microhaematocrit
 - Macrohaematocrit

Erythrocyte Sedimentation Rate (ESR)

- Wintrobe
- Westergren

Haemoglobin

- Methods of estimation
- Haemoglobin Distribution curve

Red Blood Cell Indices

- Mean Cell volume (MCV)
- Mean Cell Haemoglobin (MCH)
- Mean Cell Haemoglobin Concentration (MCHC)

Reporting of Peripheral Blood Films

Erythrocytes, Leucocytes, Thrombocytes

Blood parasites

Blood cell inclusions

Use of molecular diagnostic systems in haematology including

- Rapid diagnostic tests
- Elisa systems
- Use of test kits
- PCR
- Flow cytometry

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Assignments

Readings

Practical assessments

Assessment strategy

One assignment, one test, and one final end of semester examination to assess the learner's knowledge of the concepts, principles, and applications of routine haematology laboratory investigations.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Books and other reference materials, trainers' manual, lecture notes, handouts, flip chart holders/charts, projectors/slides, overhead projectors, textbooks, laboratory premises, equipment, apparatus, supplies, blood stains and reagents, computers and printers, access to the Internet and library.

Required text

Rodak, B. F. (2011) *Hematology: Clinical Principles and Applications*. 4th Ed. Philadelphia, PA: W. B. Saunders Co. ISBN 13: 978143770625

Recommended reading

Rodak, B.F. and Carr, J. H. (2012) *Clinical Hematology Atlas*. 4th Ed. Philadelphia, PA: Elsevier Science. ISBN 9781455708307

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity
Students with Disabilities

Course Schedule Outline/Due Dates

HCY1017: Histopathology and Cytopathology (5 credits, 75 hours)

Year 1, Semester 2 (Lecture 40 hours; Practical 35: 3 credit hours for discussion)

Instructor information

Course description

This is an introductory course that will provide the learner with the opportunity to demonstrate an understanding of the principles, applications, and common techniques used in histopathology and cytopathology. Topics covered include types of histological and cytological specimens and preparation, processing, and handling of specimens.

Pre-requisites: None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills and attitudes to perform effectively, and supervise staff, in a histopathology/cytopathology laboratory.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Describe the principles and applications of histopathology and cytopathology
2. Describe safety in a histopathology laboratory
3. Process specimens for histological and cytopathological testing
4. Prepare sections and smears for staining and mounting
5. Accurately report findings on cytological smears
6. Perform museum and mausoleum techniques
7. Perform the standard operating procedures for the microtome, various types of microtomes, and microtome knives

Course content

Introduction to Histopathology and Cytopathology

- Purpose and significance histopathology and cytopathology
- Definition of the terms
- Histology
- Histopathology
- Cytology and cytopathology
- Autolysis and Putrefaction
- Biopsies and Autopsies
- Specimen Receiving
- Records in histopathology laboratory

Types of Histological and Cytological Specimens

- Autopsies
- Biopsies
- Papanicolaou Smears (PAP)
- Fine Needle Aspirate (FNA)

Fixation of Specimens

- Purposes of Fixation
- Composition and use of fixatives (simple and compound)
- Preparation of fixatives
- Effects of fixatives on tissue components
- Methods of fixation

Histological pigments

- Definition
- Types
- Identification
- Removal

Tissue Processing

- Decalcification
 - Methods and End point

Infiltration

- Dehydration

- Clearing wax
- Embedding
- Blocking

Cutting Tissues

- Microtomy – Types of microtome, microtome knives, honing and stropping
- Sectioning

Floating Out Tissues

Adhesives

Reporting on Cytological Smears

Use of molecular diagnostic systems in cytology and histopathology including

- Use of test kits
- PCR

Teaching and learning strategies

Lectures

Small group discussions

Assignments

Readings

Demonstrations

Observations

Self-directed learning

Practical assessments

Assessment strategy

One assignment, one test and one final end of semester examination to assess the learner's knowledge of the concepts, principles and applications of histopathology and cytopathology techniques used for analysis.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Books and other reference materials, trainers' manual, lecture notes, standard operating procedures (SOPs), study guides, handouts, flip chart holders/charts, overhead projectors, projector slides, laboratory premises, equipment, apparatus, specimens, stains, and reagents, museum, mausoleum, computers and printers, LCD, access to the Internet and library.

Required text

Koss, L.G. and Melamed, M.R. (2005) *Koss' Diagnostic Cytology and its Histopathologic Bases*. 5thEd. Philadelphia, PA: Lippincott, Williams, and Wilkins. ISBN/ISSN: 9780781719285.

Recommended reading

CIBA's, E. S. and Ducatman, B. S. (2014) *Cytology Diagnostic Principles and Clinical Correlates*. 4thEd. Philadelphia, PA: Elsevier. ISBN 9781455744626

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

IBT 1018 Immunohaematology and Blood Transfusion Science (8 credits, 120 hours)

Year 1, Semester 2 (Lecture 60 hours; Practical 60 hours)

Instructor information

Course description

This course provides the learner with the basic principles and applications of blood banking and blood transfusion science. Topics covered include historical background of blood banking and blood transfusion science, immunohaematology, and blood groups.

Pre-requisites: Haematology course

Aim

The aim of this course is to enable the learner to acquire knowledge, skills and attitudes needed for optimal performance and supervision of laboratory personnel in a blood bank and blood transfusion service.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Define terminologies used in blood transfusion science
2. Describe various blood group systems
3. Perform blood grouping techniques
4. Detect blood group specific substances
5. Identify blood group abnormalities
6. Conduct compatibility testing and antibody screening
7. Investigate transfusion reactions
8. Investigate the Haemolytic Disease of the Newborn (HDNB)
9. Organise a blood bank and blood donor campaign

Content

Introduction to Blood Transfusion Science

- Organisation of a blood bank
- Importance of blood donor campaigns
- Importance of blood transfusions

Definition of terms used in blood transfusion science

- Antigen and Antibodies
- Agglutination
- Haemolysis
- Sensitisation and Precipitation
- Complement
- Hapten
- Inhibition
- Neutralisation
- Immunisation

Blood Group Systems

- History
- ABH group system
- Definition and significance of ABH system
- H-Gene
- A-Gene
- B-Gene
- Bombay phenotype

ABO Blood Group System

- Significance of ABO system
- Inheritance
- Antigens and Antibodies
- ABO sub groups
- ABO grouping techniques

Rhesus Blood Group System

- Definition
- History

- Significance of Rh system
- Inheritance
- Antigens
- Nomenclature
- Variants of D antigens
- Rhesus null phenotype
- Rhesus grouping Technique

Other Blood Group Systems

- Definition and History
- Significance of:
- MNS
- Kell
- Duffy
- I
- P
- Lewis
- Lutheran
- Kidd
- Xg

Blood Group Specific Substances

- Definition, Significance, and Types
- Secretor status (Se gene)
- Significance
- Detection techniques

Blood Group Abnormalities

- Hereditary, Conditional, Physical

Reagents

- Normal saline
- 22% bovine albumin
- Anti-Human Globulin (Coombs reagents)

- Lectins
- Antisera
- Enzymes
- Anticoagulants
 - ACD
 - CPD

Blood Donor Campaign

Screening of donor units for infectious agents

- HIV
- Hepatitis
- Syphilis

Use of molecular diagnostic systems in blood transfusion medicine including

- Rapid diagnostic tests
- Elisa systems
- Use of test kits
- PCR
- NAT testing

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Assignments

Readings

Simulations

Self-directed learning

Demonstrations

Field visits

Practical assessment

Assessment strategy

One assignment, one test, and one final end of semester examination to assess the learner's knowledge of the concepts, principles, applications, and different techniques used in a blood bank and blood transfusion service.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, standard operating procedures (SOPs), study guides, patients, blood bank premises, laboratory equipment and apparatus, handouts, flip chart holders/newsprints, overhead projectors, transparencies, charts, blood grouping kits, blood, blood bank, textbooks, computers and printers and LCD.

Required text

Blaney, K. D. and Howard, P.R. (2012) *Basic & Applied Concepts of Blood Banking and Transfusion Practices*. Philadelphia, PA: Elsevier. ISBN 9780323086639.

Recommended reading

Harmening, D. M. (2012) *Modern Blood Banking and Transfusion Practices*. 6th Ed. Philadelphia, PA: FA Davis Company.

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

PEN 1019 Medical Parasitology/Entomology (8 credits, 120 hours)

Year 1, Semester 2 (Lecture 60 hours; Practical 60 hours)

Instructor information

Course description

This course provides the learners with the principles, applications, and common techniques used in a parasitology/entomology laboratory. Topics covered include routes and mechanisms of parasites and insects infestations, classification and ecology of parasites, specimen collection techniques for parasitology and entomology investigations, reagent preparation, laboratory diagnostic techniques, preservation and storage of specimens for laboratory investigation of parasites and insects of medical importance.

Pre-requisites: Microbiology course

Aim

The aim of this course is to enable the learner to acquire knowledge, skills and attitudes, which are needed for optimal performance in parasitology/entomology laboratory, field settings, and supervision of laboratory personnel.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Describe the principles and concepts of parasitology and entomology
2. Identify molluscs of medical importance
3. Illustrate the life cycles and morphology of parasites and their vectors
4. Collect, process, and handle specimens for parasitology and entomology laboratory investigations
5. Prepare stains and reagents for use in a parasitology/entomology laboratory
6. Accurately perform diagnostic laboratory techniques for common parasitic and insect investigations in the medical laboratory and field setting

7. Maintain an animal house to support a laboratory diagnosis of parasitic infections

Content

Introduction to Medical Parasitology and Entomology

- Definition and terminology
- Classification
- Host - parasite relationship
- Modes of transmission
- Harmful effects of parasites on hosts

Specimen Collection, Processing, and Handling

- Preservation
- Transportation and Storage

Stains and Reagents

- Types
- Characteristics
- Preparation and Storage

Laboratory Techniques used in Parasitology and Entomology

- Direct wet preparations
- Concentration methods
- Smears, swabs and cultures
- Xenodiagnosis
- Immunodiagnosis
- Collection of arthropods
- Mounting and labeling
- Identification
- Dissections
- Insectaries

Protozoology Flagellates, Amoeba, Ciliates, and Sporozoa

- Introduction
- Terminologies

- Classification
- Geographical distribution
- Life-cycles
- Morphology and developmental stages
- Pathogenesis and pathology
- Laboratory diagnosis

Helminthology, Nematodes, Trematodes, and Cestodes

- Introduction
- Terminologies
- Classification
- Geographical distribution
- Life cycles
- Morphology and developmental stages
- Pathogenesis and pathology
- Laboratory diagnosis

Maintenance of Animal House

Use of molecular diagnostic systems in parasitology and entomology including

- Rapid diagnostic tests
- Elisa systems
- Use of test kits
- PCR

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Assignments

Readings

Simulations

Self-directed learning

Demonstrations
Observation
Field visits
Practicals and assessment

Assessment strategy

One assignment, one test and one final end of semester examination to assess the learner's knowledge of the concepts, principles and applications of medical parasitology and entomology and the different techniques used for analysis.

Assessment patterns

Assignment 30%
CAT 30%
Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, standard operating procedures (SOPs), study guides, laboratory premises, equipment, apparatus, and specimens, handouts, flip chart holders/newsprints, overhead projectors, transparencies, charts, resources for animal house, textbooks, computers and printers and LCD, access to the Internet and library.

Required text

Engelkirk, P.G. and Duben-Engelkirk, J.L. (2008) *Laboratory Diagnosis of Infectious Diseases: Essentials of Diagnostic Microbiology*. Baltimore, MD: Lippincott Williams & Wilkins. ISBN 13 9780781797016

Recommended reading

CDC. (n.d.) *Laboratory Identification of Parasitic Diseases of Public Health Concern* [Online] Available from: <http://www.dpd.cdc.gov/dpdx/>. [Accessed: 9th July 2014]

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

IVI 1020 Immunology and Virology (4 credits, 60 hours)

Year 1, Semester 2 (Lecture 40 hours; Practical 20 hours)

Instructor information

Course description

This course provides the learner with the basic principles and applications of routine techniques used in immunological and virology investigations. Topics covered include; properties and classification of viruses, epidemiology of viral diseases, types of viruses, human immune system, immune responses, transplantation immunology, and immunoglobulin classes.

Pre-requisites: None

Aim

The aim of this course is to enable the learner to acquire knowledge, skills, and attitudes needed for optimal performance and supervision of laboratory personnel in an immunology/virology laboratory.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Describe the principles and concepts of immunology and virology
2. Outline the epidemiology of viral diseases
3. Classify types of viruses
4. Collect, process, and analyse specimens for immunological and viral investigations
5. Describe the human immune system
6. Describe the significance of cells, tissues, and organs involved in the immune response
7. Classify types of hypersensitivity
8. Describe the mechanism involved in autoimmunity
9. Outline the concepts of transplantation immunology

10. Describe the structure and classification of immunoglobulins
11. Accurately perform laboratory techniques used for immunological and viral investigations

Content

VIROLOGY

- Definition of a virus
- Characteristics of viruses
- Classification of viruses
- RNA
- DNA
- Unclassified
- Viruses of medical importance
- Introduction to vaccination

Epidemiology of Viral Diseases

- Mode of transmission
- Infections
- Acute
- Chronic

Clinical and sub-clinical diseases

Latent infections

- Virulence (systematic or localised)

IMMUNOLOGY

- Definition of Immunology
- History of Immunology

Immune System

- Types of immunity
- Non-specific (innate)
- Specific (acquired)

Biology of the Immune System

- Primary lymphoid organs
- Secondary lymphoid organs

Immune Cells

- B-cell lymphocytes
- T-cell lymphocytes
- The mononuclear phagocytic system
- Polymorphonuclear granulocytes

Major Histocompatibility Complex (MHC)

- Functions of MHC antigens Class I, II, III

Immune Responses

- B-cell antigen recognition
- T-cell antigen recognition
- Antigen presenting cells
- Primary immune responses
- Secondary immune responses
- Immunological memory

Structure and Classification of Immunoglobulins

Types of Hypersensitivity

Mechanisms in Auto-immunity

Transplantation Immunology

Immunological techniques

Use of molecular diagnostic systems in virology including

- Rapid diagnostic tests
- Elisa systems
- Use of test kits
- PCR

Teaching and learning strategies

Lectures

Small group discussions

Assignments
Self-directed learning
Demonstrations
Practical exercises
Practical assessment
Readings

Assessment strategy

One assignment, one test, and one final end of semester examination to assess the learner's knowledge of the concepts, principles, and applications of laboratory tests used for virology and immunology investigations.

Assessment patterns

Assignment 30%
CAT 30%
Final Exam 40%

Teaching and learning resources

Trainer's manual, practical log books, standard operating procedures, lecture notes, study guides, laboratory premises, equipment and apparatus, handouts, flip chart holders/newsprints, overhead projectors, transparencies, charts, specimens, stains and reagents, immunological and viral tests, textbooks, computers, printers and LCD, access to the Internet and library.

Required text

Fraenkel-Conrat, H. Ed. (2011) *Comprehensive Virology: Volume 15: Virus-Host Interactions Immunity to Viruses*. New York, NY: Springer Publishing.

Recommended reading

Male, D. (2012) *Immunology* 8th Ed. St. Louis, Missouri: C.V. Mosby. ISBN 9780323080583

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

PHE 1021 Public Health and Epidemiology (5 credits, 75 hours)

Year 1, Semester 2 (Lecture 40 hours; Practical 35 hours)

Instructor information

Course description

The course provides the learner with the opportunity to demonstrate an understanding of local and global public health concerns, the role of the laboratory in public health services, and the impact of the spread of diseases on diverse populations and communities.

Pre-requisites: None

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, and attitudes needed for a clear understanding of public health programs and public health policy.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Demonstrate an understanding of public health monitoring systems to identify and address community health problems
2. Discuss the social determinants of health and how they relate to health disparities
3. Demonstrate an understanding of the provisions of the Republic of South Sudan's Public Health Act
4. Define and appropriately use epidemiologic terminology
5. Recognise how epidemiology contributes to public health
6. Explain the role of the laboratory in public health services
7. Understand the essential public health services in South Sudan

Course content

South Sudan's Public Health Act

South Sudan's Public Health Service

Study Unit 1: EPIDEMIOLOGY

- Define Epidemiology
- The concept of Epidemiology
- Epidemiological triad
- Endemicity, Epidemics and Outbreaks
- The roles of the laboratory in disease outbreaks
- Measures of morbidity and Mortality
- Disease surveillance
 - Definitions
 - Importance of Disease surveillance
 - Types of Surveillance
 - Surveillance Techniques
 - The Integrated Disease Surveillance and Response (IDSR) strategy

Study Unit 2: COMMUNITY HEALTH

- Define community Health
- Importance of Community Health
- Health Determinants
- Health equity
- Health disparities
- The roles of laboratories in public health

Social Determinants of Health

- Health equity
- Health disparities

The role of the laboratory in public health

Teaching and learning strategies

Lectures

Small group discussions

Self-directed learning

Readings

Assessment strategy

One assignment, one test, and one final end of semester examination to assess the learner's knowledge of the public health system, the role of governmental public health policy, and the laboratory's role in public health services.

Assessment patterns

Assignment 30%

CAT 30%

Final Exam 40%

Teaching and learning resources

Trainer's manual, lecture notes, study guides, access to the Internet and library, textbooks, handouts, flip chart holders/charts, overhead projectors, copies of the Public Health Act and other relevant government laws, computers, printers, and LCD screen.

Required text

Aschengrau A. and Seage, G.R. (2013) *Essentials of Epidemiology in Public Health*. 3rd Ed. Burlington, MA: Jones & Bartlett Learning. ISBN: 978-1284028911

Recommended reading

Joseph, V.V. *Public Health and Health Policy in South Sudan*. [Online] Available from: <http://www.southsudanmedicaljournal.com/archive/2008-02/public-health-and-health-policy-in-south-sudan.html>. [Assessed: 9th July 2014].

Ministry of Health, Republic of South Sudan. [Online] Available from: <http://www.mohss.org>. [Assessed: 9th July 2014].

CDC (2013) *Laboratory Identification of Parasitic Diseases of Public Health Concern: Monthly Case Studies-2013* [Online]

Available from: <http://www.cdc.gov/dpdx/monthlycasestudies/index.html>. [Assessed: 9th July 2014].

CDC. *Epidemiologic Case Studies*. [Online] Available from: <http://www.cdc.gov/epicasestudies/>. [Accessed: 9th July 2014].

Grading

Marks	Letter Grade
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85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

SDS 1022 Self-Directed Study II (4credits, 50 hours)

Year 1, Semester 2 (Lecture 25 hours; Practical 25 hours)

Instructor information

Course description

This course provides the learner an opportunity to independently explore a special biomedical science topic of interest, under the advisement of the instructor who will monitor and critique the learner's progress. The course may be taken for 1 to 6 credits, with department approval. The course may be repeated for credit with a change of topic.

Pre-requisites: A qualified tutor to act as course instructor. Instructor approval

Aim

The aim of this course is to enable the learner to acquire working knowledge and research skills in the exploration of a specific topic of interest to the learner.

Learning objectives

Since this is self-directed study, there must be agreement between the learner and instructor as to the learning objectives and the final product. The study must be completed in the semester taken.

Teaching and learning strategy

Self-directed learning

Assessment strategy

To be determined by the instructor

Assessment patterns

To be determined by the instructor

Teaching and learning resources

Access to the Internet and library, handouts, LCD screen, overhead projector, computers and printers.

Required text

Backer, J. R. and Brizee, A. (Eds.) (2013) *Writing a Research Paper* [Online] Available from: <https://owl.english.purdue.edu/owl/resource/658/01/>. [Accessed: 2nd July 2014].

Recommended text

HARVARD Reference Style Guide

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

14.3 Year 2, Semester 1

MLS 2023 Clinical Microbiology I (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in clinical microbiology laboratories. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learners to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, attitudes, and clinical competencies needed to perform basic techniques and procedures in a clinical microbiology laboratory within a healthcare setting.

Learning objectives

At the end of Year 2 first semester the learner will be able to:

1. Demonstrate the ability to perform optimally during a clinical attachment in a medical microbiology laboratory within a healthcare setting
2. Demonstrate the ability to apply safety techniques in a medical microbiology laboratory

3. Demonstrate the ability to perform microbiology tests according to the Standard Operating Procedures (SOPs)
4. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in microbiology
5. Demonstrate the ability to prepare bacteriological stains
6. Demonstrate the ability to prepare culture media for cultivation of microorganisms
7. Demonstrate the ability to identify various species of bacteria
8. Demonstrate the ability to perform antimicrobial susceptibility testing
9. Demonstrate the ability to collect, handle, process, preserve and transport specimens
10. Demonstrate the ability to examine and report on specimens
11. Demonstrate the ability to complete and present a clinical attachment report

Content

Clinical Placement Objectives

Systemic Bacteriology

- *Staphylococcus*
- *Streptococcus*
- Enterobacteriaceae
- *Corynebacterium*
- *Mycobacterium*
- *Treponema*
- *Borrelia*
- *Leptospira*

Safety

- Safety techniques in a microbiology laboratory

Sterilisation

- Sterilisation methods
- Disinfection

Specimens

- Collection
- Transportation
- Preservation
- Processing

Laboratory Diagnosis

- Procedures used in diagnosing diseases
- Susceptibility tests

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Lab practical exercises

Self-directed learning

Readings

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working skills, clinical competencies, attitude, and knowledge needed for optimal performance in a clinical microbiology laboratory within a healthcare setting.

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical microbiology laboratory equipment, supplies, training materials, and Standard Operating Procedures (SOPs), computers, and textbooks.

Required text

Forbes, B.A., Sahm, D. F. and Weissfeld, A.S. (2007) *Bailey & Scott's Diagnostic Microbiology* 12th Ed. Maryland Heights, MO: C. V. Mosby. ISBN: 9780323030656

Recommended reading

South African Society for Microbiology. [Online] Available from: <http://sasm.org.za>. [Accessed: 3rd July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2024 Clinical Chemistry I (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines class work and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in clinical chemistry laboratories. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learners to demonstrate learners' competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, clinical competencies, and attitudes needed for optimal performance in a clinical chemistry laboratory.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate the ability to perform optimally during attachment in a clinical chemistry laboratory within a clinical setting
2. Demonstrate the ability to apply safety techniques in a clinical chemistry laboratory
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in a clinical chemistry laboratory

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform clinical chemistry procedures according to the Standard Operating Procedures (SOPs)
7. Demonstrate the ability to complete and present a clinical attachment report
8. Demonstrate effective interpersonal communication

Content

Clinical Placement Objectives

Diagnostic Blood Tests

- Specimens (whole blood, plasma, serum)
- Qualitative - Haemolysis, jaundice, coagulum, lipaemia
- Quantitative –Glucose, proteins, urea, bilirubin, creatine, creatinine, electrolytes, uric acid, enzymes, hormones, lipids, inorganic phosphates, Alpha-fetoprotein

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Lab practical exercises

Self-directed learning

Readings

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working skills, clinical competencies, attitude, and knowledge needed for optimal performance in a clinical chemistry laboratory.

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical chemistry laboratories' equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

tMakowski, G. (2009) *Advances in Clinical Chemistry*. St. Louis, MO: Elsevier. Print Book ISBN 9780123747969; eBook ISBN 9780080950983

Recommended reading

Arneson, W. (2013) *Study Guide for Clinical Chemistry: A laboratory perspective*. Ventura, CA: Academic Internet Publishers. ISBN 9781478492238

Bishop, M.L., Fody, E. P. & Schoeff, L.E. (2005) *Clinical Chemistry: Principles, Procedures, Correlations*. Baltimore, MD: Lippincott Williams & Wilkins Publishers. ISBN 0-7817-4611-6

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2025 Clinical Haematology I (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire training in clinical haematology laboratories. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learners' competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, and attitudes needed for optimal performance in a clinical haematology laboratory.

Learning objectives

At the end of Year 2 first semester the learner will be able to:

1. Demonstrate the ability to perform optimally during clinical placement in a clinical haematology laboratory
2. Demonstrate the ability to apply safety techniques in a clinical haematology laboratory
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in a clinical haematology laboratory
4. Demonstrate the ability to collect, handle, process, preserve and transport specimens

5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform basic haematological procedures according to Standard Operating Procedures (SOPs)
7. Demonstrate the ability to complete and present a clinical attachment report

Content

Clinical Placement Objectives

Blood Collection

- Thin film
- Thick film

Preparation of Romanowsky Stains

- Leishman's stain
- Field's stain
- Giemsa stain
- May Grünwald stain
- Jenner's stain
- Wright's stain

Romanowsky Staining Techniques

Blood Cell Count

- Total
- Differential

Supra-vital Stains

- Brilliant cresyl blue
- New methylene blue
- Methyl violet

Supra-vital Staining

- Reticulocyte count
- Heinz body preparation

Packed Cell Volume Estimation

- Micro method

- Macro method

Erythrocyte Sedimentation Rate

- Wintrobe's method
- Westergren's method

Haemoglobin Estimation

- Cyanmethaemoglobin method
- Oxyhaemoglobin method
- Haemoglobin calibration curve

Reporting of Blood Films

- Red blood cells
- White blood cells
- Platelets
- Film comments

Red Blood Cell Indices

- Mean corpuscular volume (MCV)
- Mean corpuscular haemoglobin (MCH)
- Mean corpuscular haemoglobin concentration (MCHC)

Bone Marrow Film Preparation

- Straight film
- Squash film

Iron Staining Preparation

- Prussian Blue

L.E. Cell Preparation

Osmotic Fragility Test

Haemoglobin Electrophoresis

Haemoglobin F Estimation

- Singer's method

G6PD Screening Test

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Lab practical exercises

Self-directed learning

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working skills, competencies, attitude, and knowledge for optimal performance in a clinical haematology laboratory.

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical haematology laboratories equipment, supplies, training materials, and Standard Operating Procedures (SOPs), computers, and textbooks.

Required text

Moss, P. and Hoffbrand, V. (2011) *Essential Haematology*. 6th Ed. Oxford, UK: Wiley Blackwell. ISBN-13: 978-1405198905

Recommended reading

Anderson, S. and Poulsen, K.B. (2013) *Anderson's Atlas of Hematology*. Philadelphia, PA: Lippincott Williams & Wilkins. ISBN/ISSN: 9781451131505

Gulati, G. L., Filicko-O'Hara, J. and Krause, J.R. (2012) *Case Studies in Hematology and Coagulation*. Chicago, IL: ASCP Press. ISBN-10: 089189585X

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2026 Clinical Histopathology and Cytopathology (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at clinical placement sites. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in a histopathology/cytopathology laboratory. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, and attitudes needed for optimal performance in a histopathology/cytopathology laboratory.

Learning objectives

At the end of Year 2 first semester the learner will be able to:

1. Demonstrate the ability to perform optimally during clinical placement in a Histopathology and Cytopathology Department
2. Demonstrate the ability to apply safety techniques in histopathology and cytopathology
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in histopathology and cytopathology

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform basic histopathology and cytopathology procedures according to Standard Operating Procedures (SOPs)
7. Demonstrate the ability to complete and present a clinical attachment report

Course content

Clinical Placement Objectives

Preparation of Sections for Staining

- De-waxing
- Re-hydration

Staining and Mounting Sections

- Types of stains
- Principles of staining -stains and dyes
- Staining techniques-Haematoxylin and Eosin
- Special stains for- Mucin, nerve fibres, bacteria, and fungi
- Mounting – Mounting media, uses, types - DPX, Canada Balsam, methods of mounting

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Project work

Self-directed learning

Readings

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working skills, competencies, attitude, and knowledge for optimal performance in a histopathology/cytopathology laboratory.

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical histopathology/cytopathology laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and books.

Required text

Bancroft, J. D. and Gamble, M. (2008) *Theory and Practice of Histological Techniques*. 6thEd. Philadelphia, PA: Churchill Livingstone Elsevier

Cibas, E. S. and Ducatman, B. S. (2014) *Cytology Diagnostic Principles and Clinical Correlates*. 4th Ed. Philadelphia, Pennsylvania: Elsevier. ISBN 9781455744626

Recommended reading

Klernan, J. (2000). *Histological and Histochemical Methods: Theory & Practice* 3rd Ed. Florence, Kentucky: Taylor & Francis. ISBN 9780750649360

Koss, L.G. & Melamed, M.R. (2005) *Koss' Diagnostic Cytology and its Histopathologic Bases*. 5thEd. Philadelphia, PA: Lippincott, Williams, and Wilkins. ISBN/ISSN: 9780781719285.

Grading

Marks	Letter Grade
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85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2027 Clinical Blood Transfusion Science I (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at clinical placement sites. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in a blood transfusion center. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learners' competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, clinical competencies, and attitudes needed for optimal performance in a blood transfusion center.

Learning objectives

At the end of Year 2 first semester the learner will be able to:

1. Demonstrate the ability to perform optimally during clinical placement in a blood transfusion center
2. Demonstrate the ability to apply safety techniques in blood transfusion
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in blood transfusion

4. Demonstrate the ability to collect, handle, process, preserve and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform basic blood transfusion procedures according to Standard Operating Procedures (SOPs)
7. Demonstrate the ability to complete and present a clinical attachment report

Content

Clinical Placement Objectives

Blood Banking

- Introduction to blood banking
- Blood donor campaigns
- Recruitment of donors
- Screening of donors
- Phlebotomy procedures
- Packaging, transport and storage of blood

Anticoagulants used in Blood Transfusion Services

- Types of anticoagulants
- Preparation of anticoagulants
- Use, storage and care of anticoagulants

Antisera used in Blood Bank

- Types and sources of anti-sera
- Preparation, preservation, standardisation of antisera
- Storage of antisera

Techniques in Blood Transfusion

- ABO and Rhesus grouping
- D^u testing
- Coombs Test -Direct, Indirect
- Testing for minor blood groups
- Antibody titration

- Antibody identification
- Absorption techniques
- Elution techniques
- Compatibility testing - definition, importance, stages, techniques
- Transfusion Reactions-definition, categories, laboratory investigation
- Haemolytic Disease of the Newborn
- Definition
- Causes
- Clinical signs and symptoms
- Laboratory investigations
- Prevention
- Management

Clinical attachment report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Self-directed learning

Readings

Competency assessment

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working knowledge, skills, competencies, and attitude for optimal performance in a blood transfusion centre.

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, blood transfusion Centre's premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

Required text

Lozano, M., Contreras, M. I., and Blajchman, M.A. (2006) *Global Perspectives in Transfusion Medicine*. American Association of Blood Banks. ISBN-13: 978-1-56395-233-3

Recommended reading

Contreras M. (2009) *ABC of Transfusion*. 4thEd. United Kingdom: Wiley-Blackwell. ISBN-10: 1405156465

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2028 Medical Parasitology and Entomology I (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in a medical parasitology laboratory. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, and attitudes needed for optimal performance in a clinical parasitology laboratory.

Learning objectives

At the end of Year 2 first semester the learner will be able to:

1. Demonstrate the ability to perform optimally during clinical placement in a medical parasitology laboratory.
2. Demonstrate the ability to apply safety techniques in clinical parasitology
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in medical parasitology
4. Demonstrate the ability to collect, handle, process, preserve and transport specimens

5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform basic procedures according to standard operating procedures (SOPs) used in a clinical parasitology and entomology laboratory
7. Demonstrate the ability to complete and present clinical attachment report

Content

Clinical Placement Objectives

General Medical Parasitology and Entomology

- Receiving, recording and storing specimens
- Care and use of laboratory equipment and apparatus
- Educational visits to a meteorological station

Parasitological Techniques

- Direct wet preparations
 - Concentration methods:
 - Sedimentation
 - Modified formal ether
 - Zinc sulphate flotation
 - Membrane filtration
 - Brine floatation
 - Parasite count:
- Kato thick smear
- Stoll's method
- Macmaster chamber
- Malaria /QBC
- Swabs and smears
- Cultures
- Immunodiagnosis

Medical Protozoology

- Collection, processing and examination

- Identification of diagnostic stages
- Reporting the findings
- Analysing the results

Medical Entomology

- Arthropods
 - -classification
 - -life cycles
 - -morphology of developmental stages
 - -identification of vectors
 - -medical importance
 - -geographical distribution
 - -prevention and control of vectors
 - -caused conditions
- Arachnids
 - classification
 - life cycles
 - morphology of developmental stages
 - identification of vectors
 - medical importance
 - geographical distribution
 - prevention and control of vectors
- Collection and mounting of arthropods
- Identification and labeling
- Preservation and storage
- Dissections
- Xenodiagnosis
- Educational visits to an insectary
- Preparation of pesticides
 - Insecticides/imagicides
 - Parricides

- Molluscides
- Arachnids
- Miticides
- Fungicides
- Storage and disposal of chemicals

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Lab practical exercises

Self-directed learning

Readings

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate learner's working skills, competencies, attitude, and knowledge for optimal performance in a medical parasitology department.

Assessment patterns

Assignments 30%

Practical assessments 30%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, Medical Parasitology Department's equipment, supplies, training materials, and Standard Operating Procedures (SOPs), computers, and textbooks.

Required texts

Service, M.W. (2012) *Medical Entomology for Students*. 5th Ed. Cambridge, Massachusetts: Cambridge University Press. ISBN 9781107668188

Zeibig, E. (2010) *Clinical Parasitology: A Practical Approach*. 2nd Ed. Philadelphia, Pennsylvania: Saunders. ISBN 9781416060444

Recommended reading

CDC. (n.d.) *Laboratory Identification of Parasitic Diseases of Public Health Concern*. [Online] Available from: <http://www.dpd.cdc.gov/dpdx/>. [Accessed 6th July 2014]

Gullan, P.J. and Crnaston, P.S. (2010) *The Insects: An Outline of Entomology*. 4th Ed. Hoboken, New Jersey: Wiley-Blackwell

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2029 Clinical Immunology and Virology I (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in a clinical immunology/virology laboratory. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learners' competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to acquire working knowledge, skills, and attitudes needed for optimal performance in a clinical immunology/virology laboratory.

Learning objectives

At the end of Year 2 first semester the learner will be able to:

1. Demonstrate the ability to perform optimally during clinical placement in a clinical immunology/virology laboratory
2. Demonstrate the ability to apply safety techniques in immunology and virology
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in immunology and virology
4. Demonstrate the ability to collect, handle, process, preserve and transport specimens

5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform basic immunology and virology procedures according to Standard Operating Procedures (SOPs) in a clinical immunology/virology laboratory
7. Demonstrate the ability to complete and present a clinical attachment report

Content

Clinical Placement

IMMUNOLOGY

- Immunochemistry
 - Antibody separation
- Immunoglobulins
 - structure
 - classification
 - distribution
- Theories of antibody formation
- Antibody-antigens reactions
 - agglutination
 - precipitation
 - haemolysis
- Complement System and Titration
- Hypersensitivity reactions
 - Type I
 - Type II
 - Type III
 - Type IV

Safety of Laboratory Animals

- Biosafety techniques in an immunology laboratory
 - Handling
 - Bleeding
 - Injection

Immunologic Techniques

- Antibody-antigens
- Agglutination
- Precipitation
- Complement Fixation Text
- ELISA
- PCR

Equipment

- Use and care of equipment

VIROLOGY

Safety

- Biosafety technology in virology laboratory

Sterilisation

- Sterilisation and disinfection techniques

Virology Specimens

Specimen containers

Types of specimens

Collection, Handling

Transportation

Storage

Preservation

Clinical attachment report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Lab practical exercises

Self-directed learning

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working skills, competencies, attitude, and knowledge for optimal performance in a clinical immunology/virology laboratory.

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical immunology/virology laboratory premises equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

Required texts

Delves P.J, Martin, S.J. Burton, D.R. and Roitt, I.M. (2011) *Roitt's Essential Immunology*. 12thEd. Hoboken, New Jersey: Blackwell Publishing.

Zuckerman (2004) *Principles and Practice of Clinical Virology*. 5thEd. Hoboken, New Jersey: Wiley Blackwell. ISBN-13: 978-0470843383

Recommended reading

Isaacs, D. (2013, May) *Clinical Cases in Virology*. [Online] Available from: <http://www.rcpa.edu.au/getattachment/47a2cb2e-77a4-4377-aac3-7df8f8851c57/Dr-Davis-Isaacs-Clinical-cases-in-virology.aspx>. [Accessed: 5th July 2014].

Essentials of Clinical Immunology Case Studies. [Online] Available from: <http://www.immunologyclinic.com/CaseIndex.asp>. [Accessed: 5th July 2014].

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

SDS 2030 Self-Directed Study III (6 credits, 100 hours)

Year 2, Semester 1 (Lecture 50 hours; Practical 50 hours)

Instructor information

Course description

This course provides the learner an opportunity to independently explore a special biomedical science topic of interest under the advisement of the instructor who will monitor and critique the learner's progress. The course may be taken for 1 to 6 credits, with department approval. The course may be repeated for credit with a change of topic.

Pre-requisites: A qualified tutor to act as course instructor. Instructor approval

Aim

The aim of this course is to enable the learner to acquire working knowledge and research skills in the exploration of a specific biomedical science topic of interest to the learner.

Learning objectives

Since this is self-directed study, there must be agreement between the learner and instructor as to the learning objectives and the final product. The study must be completed in the semester taken.

Teaching and learning strategy

Self-directed learning

Assessment strategy

To be determined by the instructor

Assessment patterns

To be determined by the instructor

Teaching and learning resources

Access to the Internet and Library, handouts, LCD projector, overhead projector, computers, and printers.

Required text

Backer, J. R. and Brizee, A. (Eds.) (2013) *Writing a Research Paper* [Online]. Purdue University Owl Online Writing Lab. Available from:

<https://owl.english.purdue.edu/owl/resource/658/01/>. [Accessed: 2nd July 2014].

Recommended text

HARVARD Reference Style Guide

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

14.4 Year 2, Semester 2

MLS 2031 Clinical Microbiology II (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in all sections of clinical microbiology. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to further develop essential knowledge, skills, clinical competencies, and attitudes needed for optimal performance in all sections of a clinical microbiology laboratory within a healthcare setting.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate ability to perform procedures in water bacteriology
2. Demonstrate ability to perform bacteriological analysis of water, milk and food

3. Demonstrate ability to perform basic laboratory tests in mycology
4. Demonstrate ability to outline the importance of laboratory tests in the diagnosis and management of diseases
5. Demonstrate ability to outline the importance of effective communication between clinical and laboratory staff
6. Demonstrate ability to complete and present a clinical attachment report

Content

Clinical Placement

Bacteriology of Water, Milk, and Food

- Water sampling
- Bacteriology of water, milk and food

Bacteriological analysis of water, milk and food

Mycology

- Definition
- Morphological classification
- Laboratory diagnosis
- Diseases

Culture methods in mycology laboratory

Clinical Significance of Laboratory Tests

- Diseases causing fever
- Diarrhoeal diseases
- Sexually transmitted diseases
- Skin diseases
- Diseases causing cough and shortness of breath
- Diseases causing oedema
- Diseases causing jaundice

Clinical attachment report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Self-directed learning

Readings

Competency assessment

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working knowledge, skills, clinical competencies, attitude, for optimal performance in all areas of a clinical microbiology laboratory within a healthcare setting.

Assessment patterns

Assignments 30%

Practical assessments 30%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, laboratory premises, equipment, supplies, training materials, standard operating procedures (SOPs), computers, and textbooks.

Required text

Greenwood, D. Slack, R.C. B, Peutherer, J. F. and Barer, M.R. (2007)
Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. 17th Ed. Philadelphia, PA: Elsevier Health. ISBN 9780443102097

Larone D.H. (2002) *Medically Important Fungi: a Guide to Identification*. Herndon, VA: ASM Press

Recommended reading

Cheesbrough, M. (2006) *District Laboratory Practice in Tropical Countries: Part 1*. 2nd Ed. United Kingdom: Cambridge University Press. ISBN 9780521684583

Cheesbrough, M. (2006) *District Laboratory Practice in Tropical Countries: Part 2*. 2nd Ed. United Kingdom: Cambridge University Press. ISBN 9780521676311

Berman, J. (2009) *WHO: Waterborne Disease is World's Leading Killer*. [Online]
Available from: <http://www.voanews.com/content/a-13-2005-03-17-voa34-67381152/274768.html>. [Accessed: 6th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2032 Clinical Chemistry II (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in all sections of a clinical chemistry laboratory within a healthcare setting. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is to enable the learner to further develop working knowledge, skills, clinical competencies, and attitudes needed for optimal performance in all sections a clinical chemistry laboratory within a healthcare setting.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate the ability to perform optimally during a clinical attachment in all sections of a clinical chemistry laboratory within a healthcare setting
2. Demonstrate the ability to apply safety techniques in a clinical chemistry laboratory within a healthcare setting
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in a clinical chemistry laboratory within a healthcare setting

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform procedures in clinical chemistry on cerebral spinal fluid (CSF), stool, and gastric juice in accordance with standard operating procedures (SOPs)
7. Demonstrate the ability to outline the importance of laboratory tests in the diagnosis and management of diseases
8. Demonstrate the ability to use effective communication between clinical and laboratory staff
9. Demonstrate the ability to complete and present a clinical attachment report

Content

Clinical Placement

Diagnostic Tests in Cerebral Spinal Fluid (CSF)

- Appearance – colour, turbidity, coagulum
- Glucose
- Protein

Diagnostic Tests in Stool

- Tryptic activity
- Faecal fat
- Occult blood

Diagnostic Tests in Gastric Juice

Check for:

- Volume
- Appearance
- Starch
- Bile pigments
- Blood
- Mucus

Clinical Significance of Laboratory Tests

- Diseases causing oedema
- Diseases causing jaundice

Clinical attachment report

Interpersonal communication

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Self-directed learning

Readings

Competency assessment

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate learner's working knowledge, skills, clinical competencies, attitude, for optimal performance in all sections of a clinical chemistry laboratory within a healthcare setting.

Assessment patterns

Assignments 30%

Practical assessments 30%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical chemistry laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

Required text

Makowski, G. (2009) *Advances in Clinical Chemistry*. St. Louis, MO: Elsevier. Print Book ISBN 9780123747969; eBook ISBN 9780080950983

Recommended reading

Bishop, M.L., Fody, E. P. and Schoeff, L.E. (2005) *Clinical Chemistry: Principles, Procedures, Correlations*. Baltimore, MD: Lippincott Williams & Wilkins Publishers, ISBN 0-7817-4611-6

Australasian Association of Clinical Biochemists. (n.d.) *Clinical Chemistry Clinical Case Studies*. [Online] Available from:

http://oldsite.aacb.asn.au/web/Education/Clin_Chem_Clinical_Case_Studies/.

[Accessed: 2nd July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2033 Clinical Haematology II (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in all sections of a clinical haematology laboratory within a healthcare setting. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learners' competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is to enable the learner to further develop essential knowledge, skills, and attitudes needed for optimal performance in all sections of a clinical haematology laboratory within a healthcare setting.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate the ability to perform optimally during a clinical attachment in all sections of a clinical haematology laboratory within a healthcare setting
2. Demonstrate the ability to apply safety techniques in a clinical haematology laboratory within a healthcare setting
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in a clinical haematology laboratory within a healthcare setting

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate ability to perform all laboratory tests in a clinical haematology laboratory in accordance with the standard operating procedures (SOPs)
7. Demonstrate the ability to outline the importance of laboratory tests in the diagnosis and management of diseases
8. Demonstrate the ability to outline the importance of effective communication between clinical and laboratory staff
9. Demonstrate the ability to complete and present a clinical attachment report

Content

Clinical Placement

Haemostasis

- Definition
- Coagulation mechanisms
 - Vascular
 - Intrinsic
 - Extrinsic
 - Common Pathway
- Coagulation Tests
 - Bleeding time
 - Clotting time
 - Prothrombin Time (PT)
 - Activated Partial Thromboplastin Time (APTT)

Clinical Significance of Laboratory Tests

Communication skills

Clinical attachment report

Teaching and learning strategies

Lectures

Small group discussions
Demonstrations
Observations
Assignments
Lab practical exercises
Self-directed learning
Competency assessment
Readings

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate learner's working skills, clinical competencies, attitude, and knowledge needed for optimal performance in all sections of a clinical haematology laboratory

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to the Internet and library, clinical haematology laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks

Required text

Moss, P. and Hoffbrand, V. (2011) *Essential Haematology*. 6th Ed. Oxford: Wiley Blackwell. ISBN-13: 978-1405198905

Recommended reading

African Journal of Laboratory Medicine. [Online] Available from:
<http://www.ajlmonline.org/index.php/ajlm>. [Accessed: 2nd July 2014].

African Journal of Health Sciences. [Online] Available from:

<http://www.ajol.info/index.php/ajhs>. [Accessed: 2nd July 2014].

Gulati, G. L., Filicko-O'Hara, J. & Krause, J.R. (2012) *Case Studies in Hematology and Coagulation*. Chicago, IL: ASCP Press. ISBN-10: 089189585X

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2034 Clinical Histopathology and Cytopathology II (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines some classwork and mostly supervised training at clinical placement sites. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in all sections of a histopathology/cytopathology laboratory within a healthcare setting. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is to enable the learner to further develop essential knowledge, skills, clinical competencies, and attitudes needed for optimal performance in all sections of a histopathology/cytopathology laboratory within a healthcare setting.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate the ability to perform optimally during a clinical attachment in all sections of a histopathology/cytopathology laboratory within a healthcare setting
2. Demonstrate the ability to apply safety techniques in histopathology and cytopathology
3. Demonstrate the ability to perform sterilisation, disinfection and disposal methods in histopathology and cytopathology

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform procedures in histopathology and cytopathology in accordance with standard operating procedures (SOPs)
7. Demonstrate the ability to outline the importance of laboratory tests in the diagnosis and management of diseases
8. Demonstrate the ability to outline the importance of effective communication between clinical and laboratory staff
9. Demonstrate the ability to complete and present a clinical attachment report

Course content

Clinical Placement

Museum Techniques

- Collection of specimens
- Preservation
- Labeling
- Display

Mortuary Techniques

- Public Relations
- Culture and religious values
- Handling the deceased body
- Post-Mortem
- Embalming

Cytological Techniques

- Collection and fixation
- Definition, terminologies and applications of cytology
- Sources of specimens
- Preparation of smears, fixation, packaging and transportation
- Papanicolaou staining

- Classification of Pap smears

Communication Skills

Clinical attachment project

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Self-directed learning

Readings

Competency assessment

Assessment strategy

Assignments, practical assessments and one final project to evaluate the learner's working knowledge, skills, clinical competencies, and attitude needed for optimal performance in all sections of a histopathology/cytopathology laboratory within a healthcare setting.

Assessment patterns

Assignments 30%

Practical assessments 30%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, histopathology/cytopathology laboratory premises equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

Required text

Koss, L.G. & Melamed, M.R. (2005) *Koss' Diagnostic Cytology and its Histopathologic Bases*. 5th Ed. Philadelphia, PA: Lippincott, Williams, and Wilkins. ISBN/ISSN: 9780781719285.

Eroschenko, P. (2000) *di Fiore's Atlas of Histology with Functional Correlations*. 9th Ed. Philadelphia, PA: Lippincott Williams & Wilkins

Recommended reading

Cibas, E. S. & Ducatman, B. S. (2014) *Cytology Diagnostic Principles and Clinical Correlates*. 4th Ed. Philadelphia, PA: Elsevier. ISBN 9781455744626

Kargar. *Acta Cytologica: Current Issues of the Journal of Clinical Cytology and Cytopathology*. [Online] Available from: <http://www.karger.com/Journal/Home/254338>. [Accessed: 5th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2035 Clinical Blood Transfusion Science II (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines some classwork and mostly supervised training at clinical placement sites. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in all sections of a blood transfusion center within a healthcare setting. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is to enable the learner to further develop essential working knowledge, skills, and attitudes needed for optimal performance in all sections of a blood transfusion center within a healthcare setting.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate the ability to perform optimally during a clinical attachment in a blood transfusion center within a healthcare setting
2. Demonstrate the ability to apply safety techniques during a blood transfusion
3. Demonstrate the ability to perform sterilisation, disinfection, and disposal methods in a blood transfusion center within a healthcare setting

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to accurately perform procedures in all areas of a blood transfusion
7. Demonstrate the ability to outline the importance of laboratory tests in the diagnosis and management of diseases
8. Demonstrate the ability to outline the importance of effective communication between clinical and laboratory staff
9. Demonstrate the ability to complete and present a clinical attachment report

Content

Complement

- Significance in Blood Transfusion Science

Blood Donor Service

- National policy guidelines in blood transfusion
- Organisation of a blood donor center
- Blood Donor campaigns
- Recruitment of donors
- Phlebotomy procedures
- Screening of donated blood
- Documentation
- Storage of blood
- Transportation of donated blood
- Cycling of donor blood
- Disposal of blood
- Safety in the blood bank
- Maintenance of blood bank equipment

Blood Products

- Definition

- Types
- Uses
- Preparation
- Storage

Communication

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Self-directed learning

Readings

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working knowledge, skills, competencies, and attitude needed for optimal performance in all areas of a blood transfusion center within a healthcare setting.

Assessment patterns

Assignments 30%

Practical assessments 30%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, blood transfusion center premises equipment, supplies, training materials, standard operating procedures (SOPs), computers, and textbooks.

Required texts

Blaney, K. D. & Howard, P.R. (2012) *Basic & Applied Concepts of Blood Banking and Transfusion Practices*. Philadelphia, PA: Elsevier. ISBN 9780323086639.

World Health Organization. (2014) *10 Facts on Blood Transfusion*. [Online] Available from: http://www.who.int/features/factfiles/blood_transfusion/en/. [Accessed 3rd July 2014].

Recommended reading

Archive of Blood Transfusion Articles. [Online] Available from:

<http://www.ncbi.nlm.nih.gov/pmc/journals/669/>. [Accessed: 3rd July 2014].

Rudman, S. V. (2005) *Blood Banking and Transfusion Medicine*. 2nd Ed. Philadelphia, PA: Elsevier Saunders. ISBN 9780721603841

Journal of Blood Transfusion. [Online] Available from:

<http://www.hindawi.com/journals/jbt/>. [Accessed: 3rd July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2036 Medical Parasitology/Entomology II (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in all sections of a medical parasitology/entomology laboratory within a healthcare setting. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is to enable the learner to further develop essential knowledge, skills, clinical competencies, and attitudes needed for optimal performance in all sections of a medical parasitology/entomology laboratory within a healthcare setting.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate the ability to perform optimally during a clinical attachment in all sections of a medical parasitology/entomology laboratory within a healthcare setting
2. Demonstrate the ability to apply safety techniques in parasitology and entomology
3. Demonstrate the ability to perform sterilisation, disinfection, and disposal methods in parasitology and entomology

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform all laboratory tests in parasitology and entomology in accordance with standard operating procedures (SOPs)
7. Demonstrate the ability to outline the importance of laboratory tests in the diagnosis and management of diseases
8. Demonstrate the ability to outline the importance of effective communication between clinical and laboratory staff
9. Demonstrate the ability to complete and present a clinical attachment report

Content

Malacology

- Introduction and terminologies
- Classification
- Life-cycles
- Morphology and identification of vector snails
- Geographical distribution
- Medical importance
- Control

Malacological Techniques

- Collection and transportation of molluscs
- Cercarial shedding and identification
- Preservation and identification of molluscan shells

Mammology

- Introduction and terminologies
- General classification of animals

Animal house

- Management, use and disposal of laboratory animals
- Medical importance

- Control of mammalian reservoir hosts

Insecticides and Molluscides

- Classification
- Formulation
- Introduction to application methods
- Safe use

Communication Skills

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Self-directed learning

Competency assessment

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working knowledge, skills, clinical competencies, and attitude needed for optimal performance in all sections of a parasitology/entomology laboratory within a healthcare setting.

Assessment patterns

Assignments	30%
Practical assessments	30%
Final project	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, parasitology/entomology laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

Required text

John, D.T. and Petri, W.A. (2006)*Markell and Voge's Medical Parasitology*. 9th Ed. St. Louis, MO: Saunders Elsevier. ISBN 9780721647937

Recommended reading

CDC. (n.d.)*Laboratory Identification of Parasitic Diseases of Public Health Concern*. [Online] Available from: <http://www.dpd.cdc.gov/dpdx/>. [Accessed: 3rd July 2014].

Prasad, K.J. (2010, March) *Emerging and Re-emerging Parasitic Diseases*. [Online] Available from: <http://medind.nic.in/jav/t10/i11/javt10i1p45.pdf>. [Accessed: 3rd July 2014].

Anamo, Z and Baraki, N. (2008).*Medical Entomology*. [Online] Available from: http://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_students/MedicalEntomology.pdf. [Accessed: 3rd July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 2037 Clinical Immunology and Virology II (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course combines classwork and supervised training at the clinical attachment site/s. The course provides the learner with an opportunity to acquire working knowledge, demonstrate skills, and gain experience from supervised training in all sections of a clinical immunology/virology laboratory. During the clinical attachment training period, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies mastered.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is to enable the learner to further develop essential knowledge, skills, clinical competencies, and attitudes needed for optimal performance in all sections of a clinical immunology/virology laboratory within a healthcare setting.

Learning objectives

At the end of Year 2 second semester the learner will be able to:

1. Demonstrate the ability to perform optimally during clinical placement in all sections of a clinical immunology/virology laboratory within a healthcare setting
2. Demonstrate the ability to apply safety techniques in clinical immunology and virology
3. Demonstrate the ability to perform sterilisation, disinfection, and disposal methods in immunology and virology

4. Demonstrate the ability to collect, handle, process, preserve, and transport specimens
5. Demonstrate the ability to examine and report on specimens
6. Demonstrate the ability to perform immunology and virology laboratory tests in accordance with standard operating procedures (SOPs)
7. Demonstrate the ability to outline the importance of laboratory tests in the diagnosis and management of diseases
8. Demonstrate the ability to outline the importance of effective communication between clinical and laboratory staff
9. Demonstrate the ability to complete and present a clinical attachment report

Content

Clinical Placement

Safety

Biosafety in a Clinical Immunology/Virology Laboratory

IMMUNOLOGY

Autoimmunity

- Definition
- Self-tolerance
- Emergence of autoimmune disorders

Transplantation

- Tissue
- Organ
- Typing
- Rejection

Immunodeficiency States

- Definition
- Primary immunodeficiency
- Secondary immunodeficiency

- Mechanisms leading to immunodeficiency
- Methods of investigation

Safety of Laboratory Animals

- Biosafety techniques in an immunology laboratory
- Handling
- Bleeding
- Injection

Immunochemistry

Antibody separation

Immunological Techniques

- Antibody-Antigen
- Agglutination
- Precipitation
- Complement fixation test
- ELISA

Equipment

- Use and care of equipment

VIROLOGY

Safety

Biosafety technology in a virology laboratory

Sterilisation

- Sterilisation techniques
- Disinfection

Equipment

- Use and care of equipment

Specimens

Collection

Containers

Transport

Storage

Preservation

Laboratory Diagnosis

- Serology / Immunological techniques
- Measuring titres
- Reverse Passive Haemagglutination Assay (RPHA)
 - Rapid assays
 - Tissue culture
 - Animal inoculation

Animal house

- Handling
- Bleeding
- Injection
- Feeding

Communication Skills

Clinical Attachment Report

Teaching and learning strategies

Lectures

Small group discussions

Demonstrations

Observations

Assignments

Practical exercises

Self-directed learning

Competency assessment

Assessment strategy

Assignments, practical assessments and one clinical attachment report to evaluate the learner's working knowledge, skills, clinical competencies and attitudes needed for

optimal performance in all sections of a clinical immunology/virology laboratory within a healthcare setting.

Assessment patterns

Assignments	30%
Practical assessments	30%
Clinical attachment report	40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical immunology/virology laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

Required text

Peakman, M. and Vergani, D. (2009) *Basic and Clinical Immunology*. 2nd Edition. St. Louis, MO: Elsevier. ISBN 9780443100826

Reiss, C. S. Ed (2009) *Principles and Practices of Clinical Virology*. 6th Ed. Hoboken, NJ: Wiley-Blackwell. ISBN 9780470517994

Recommended reading

Wood, P. (2012) *Understanding Immunology*. 3rd Ed. Canada: Pearson Education. ISBN 9780273730682

Lima, V. (2013) *Virology Clinical Cases*. [Online] Available from: <http://www.sci.ccny.cuny.edu/~lima/case7.html>. [Accessed: 6th July 2014].

Lima, V. (2013) *Immunology Clinical Cases*. [Online] Available from: <http://www.sci.ccny.cuny.edu/~lima/immunology.html>. [Accessed: 6th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B

65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

SDS 2038 Self-Directed Study IV (6 credits, 100 hours)

Year 2, Semester 2 (Lecture 50 hours; Practical 50 hours)

Instructor information

Course description

This course provides the learner an opportunity to independently explore a special biomedical science topic of interest, under the advisement of the instructor who will monitor and critique the learner's progress. The course may be taken for 1 to 6 credits, with department approval. The course may be repeated for credit with a change of topic.

Pre-requisites: A qualified tutor to act as course instructor. Instructor approval

Aim

The aim of this course is to enable the learner to acquire working knowledge and research skills in the exploration of a specific biomedical science topic of interest to the learner.

Learning objectives

Since this is self-directed study, there must be agreement between the learner and instructor as to the learning objectives and the final product. The study must be completed in the semester taken.

Teaching and learning strategy

Self-directed learning

Assessment strategy

To be determined by the instructor

Assessment patterns

To be determined by the instructor

Teaching and learning resources

Access to the Internet and Library, handouts, LCD projector, overhead projector, computers and printers.

Required text

Backer, J. R. and Brizee, A. (Eds.) (2013) *Writing a Research Paper* [Online] Available from: <https://owl.english.purdue.edu/owl/resource/658/01/>. [Accessed: 2nd July 2014].

Recommended text

HARVARD Reference Style Guide

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

14.5 Year 3, Semester 1

MLS 3039 Clinical Microbiology III (6 credits, 100 hours)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course provides the learner with an opportunity to gain experience as a trainee during clinical rotations in a microbiology department within a healthcare setting. The learner will be assessed in the competencies acquired while undergoing supervised training in each section of the department. During this clinical placement, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies acquired.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is for the learner to acquire specialised skills and clinical competencies needed for independent work and optimal performance in a Microbiology Department within a healthcare setting.

Learning objectives

At the end of Year 3 first semester the learner will be able to:

1. Apply knowledge for the appropriate collection, handling, and processing of patient specimens
2. Comply with the medical laboratory's safety standards
3. Follow general laboratory operations

4. Comply with the standard operating procedures
5. Apply quality control methods in all areas of the clinical attachment
6. Successfully complete all competencies listed in the clinical attachment logbook
7. Demonstrate appropriate ethical and professional conduct
8. Communicate effectively with peers and other health practitioners
9. Perform laboratory procedures effectively and efficiently under the direct supervision of a qualified laboratory professional in all areas of the clinical attachment
10. Conduct a literature review of current trends in clinical microbiology
11. Critique patient case studies in microbiology
12. Complete and present the clinical attachment report

Content

Clinical Placement

Clinical competencies

Logbook

Lab practice

Skill development

Communication

Professionalism

Medical ethics

Literature review

Case studies

Clinical attachment report

Teaching and learning strategies

Self-directed learning

Hands-on practice at clinical attachment

Readings

Observations

Demonstrations

Practicals

Competency assessment

Assessment strategy

A continuous assessment, clinical attachment checklist, a clinical attachment report, and a practical examination to evaluate the learner's technical and practical skills, clinical competencies, attitude, and knowledge needed for optimal performance in a microbiology department.

Assessment patterns

Continuous assessment 60%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, laboratory premises, equipment, supplies, training materials, standard operating procedures (SOPs), computers, printers, and textbooks.

Required text

Greenwood, D. Slack, R.C. B, Peutherer, J. F. and Barer, M.R. (2007)

Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity,

Laboratory Diagnosis and Control. 17th Ed. Philadelphia, PA: Elsevier Health. ISBN 9780443102097

Larone D.H. (2002) *Medically Important Fungi: a Guide to Identification.* Herndon, VA: ASM Press

Recommended reading

Cheesbrough, M. (2006) *District Laboratory Practice in Tropical Countries: Part 1.* 2nd Ed. United Kingdom: Cambridge University Press. ISBN 9780521684583

Cheesbrough, M. (2006) *District Laboratory Practice in Tropical Countries: Part 2.* 2nd Ed. United Kingdom: Cambridge University Press. ISBN 9780521676311

Berman, J. (2009) *WHO: Waterborne Disease is World's Leading Killer*. [Online]
Available from: <http://www.voanews.com/content/a-13-2005-03-17-voa34-67381152/274768.html>. [Accessed: 6th July 2014].

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 3040 Clinical Chemistry III (6 credits, 100 hours)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course provides the learner with an opportunity to gain experience as a trainee during clinical rotations in a chemistry department within a healthcare setting. The learner will be assessed in the competencies acquired while undergoing supervised training in each section of the department. During this clinical placement, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies acquired.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is for the learner to acquire specialised skills and clinical competencies needed for independent work and optimal performance in a chemistry department within a healthcare setting.

Learning objectives

At the end of Year 3 first semester, the learner will be able to:

1. Apply knowledge for the appropriate collection, handling and processing of patient specimens
2. Comply with medical laboratories safety standards
3. Comply with the standard operating procedures
4. Apply quality control methods in all areas of the clinical attachment
5. Successfully complete all competencies listed in the clinical attachment logbook

6. Demonstrate appropriate ethical and professional conduct
7. Communicate effectively with peers and other health practitioners
8. Perform laboratory procedures effectively and efficiently under the direct supervision of a qualified laboratory professional in all areas of the chemistry clinical attachment
9. Conduct a literature review of current trends in clinical chemistry
10. Critique patient case studies in clinical chemistry
11. Complete and present the clinical attachment report

Content

Clinical Placement

Clinical competencies

Logbook

Lab practice

Skill development

Communication

Professionalism

Biomedical ethics

Literature review (clarification)

Case studies

Clinical attachment report

Teaching and learning strategies

Self-directed learning

Hands-on practice at clinical attachment

Readings

Observations

Demonstrations

Practicals

Competency assessment

Assessment strategy

A continuous assessment, clinical attachment checklist, a clinical attachment report, and a practical examination to evaluate the trainee's technical, practical, and research skills, clinical competencies, attitude, and knowledge needed for optimal performance in a Chemistry Department.

Assessment patterns

Continuous assessment 60%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical chemistry laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, printers, and textbooks.

Required text

Makowski, G. (2009) *Advances in Clinical Chemistry*. St. Louis, MO: Elsevier. Print Book ISBN 9780123747969; eBook ISBN 9780080950983

Recommended reading

Bishop, M.L., Fody, E. P. and Schoeff, L.E. (2005) *Clinical Chemistry: Principles, Procedures, Correlations*. Baltimore, MD: Lippincott Williams & Wilkins Publishers, ISBN 0-7817-4611-6

Australasian Association of Clinical Biochemists. *Clinical Chemistry Clinical Case Studies*. [Online] Available from:

http://oldsite.aacb.asn.au/web/Education/Clin_Chem_Clinical_Case_Studies/.

[Accessed: 2nd July 2014].

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 3041 Clinical Haematology III (6 credits, 100 hours)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course provides the learner with an opportunity to gain experience as a trainee during clinical rotations in a haematology department within a healthcare setting. The learner will be assessed in the competencies acquired while undergoing supervised training in each section of the department. During this clinical placement, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies acquired.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is for the learner to acquire specialised skills and clinical competencies needed for independent work and optimal performance in a haematology department within a healthcare setting.

Learning objectives

At the end of Year 3, first semester the learner will be able to:

1. Apply knowledge for the appropriate collection, handling, and processing of patient specimens
2. Comply with the medical laboratory's safety standards
3. Comply with the standard operating procedures
4. Apply quality control and quality assurance methods in all areas of the clinical attachment

5. Successfully complete all competencies listed in the clinical attachment logbook
6. Demonstrate appropriate ethical and professional conduct
7. Communicate effectively with peers and other health practitioners
8. Perform laboratory procedures effectively and efficiently under the direct supervision of a qualified laboratory professional in all areas of the clinical haematology attachment
9. Conduct a literature review of current trends in clinical hematology
10. Critique patient case studies in clinical haematology
11. Complete and present the clinical haematology attachment report

Content

Clinical Placement

Clinical competencies

Logbook

Lab practice

Skill development

Communication

Professionalism

Biomedical ethics

Literature review

Case studies

Clinical haematology attachment report

Teaching and learning strategies

Self-directed learning

Hands-on practice at clinical attachment

Readings

Observations

Demonstrations

Practicals

Competency assessment

Assessment strategy

A continuous assessment, clinical attachment checklist, a clinical attachment report, and a practical examination to evaluate the trainee's technical, practical, and research skills, clinical competencies, attitude, and knowledge needed for optimal performance in a Haematology Department.

Assessment patterns

Continuous assessment 60%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to the Internet and library, clinical haematology laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, printers, and textbooks.

Required text

Moss, P. and Hoffbrand, V. (2011) *Essential Haematology*. 6thEd. Oxford: Wiley Blackwell. ISBN-13: 978-1405198905

Recommended reading

African Journal of Laboratory Medicine. [Online] Available from:
<http://www.ajlmonline.org/index.php/ajlm>. [Accessed: 2nd July 2014].

African Journal of Health Sciences. [Online] Available from:
<http://www.ajol.info/index.php/ajhs>. [Accessed: 2nd July 2014].

Gulati, G. L., Filicko-O'Hara, J. & Krause, J.R. (2012) *Case Studies in Hematology and Coagulation*. Chicago, IL: ASCP Press. ISBN-10: 089189585X

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 3042 Clinical Histopathology and Cytopathology III (6 credits, 100 hours)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course provides the learner with an opportunity to gain experience as a trainee during clinical rotations in a histopathology/cytopathology department within a healthcare setting. The learner will be assessed in the competencies acquired while undergoing supervised training in each section of the department. During this clinical placement, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies acquired.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is for the learner to acquire specialised skills and clinical competencies needed for independent work and optimal performance in a histopathology/cytopathology department within a healthcare setting.

Learning objectives

At the end of Year 3 first semester the learner will be able to:

1. Apply knowledge for the appropriate collection, handling, and processing of patient specimens
2. Comply with the medical laboratory's safety standards
3. Comply with the standard operating procedures
4. Apply quality control and quality assurance methods in all areas of the clinical attachment

5. Successfully complete all competencies listed in the clinical attachment logbook
6. Demonstrate appropriate ethical and professional conduct
7. Communicate effectively with peers and other health practitioners
8. Perform laboratory procedures effectively and efficiently under the direct supervision of a qualified laboratory professional in all areas of the clinical attachment
9. Conduct a literature review of current trends in histopathology/cytopathology
10. Critique patient case studies in histopathology/cytopathology
11. Complete and present the histopathology laboratory clinical attachment report

Content

Clinical Placement

Clinical competencies

Logbook

Lab practice

Skill development

Communication

Professionalism

Biomedical ethics

Literature review

Case studies

Histopathology clinical attachment report

Teaching and learning strategies

Self-directed learning

Hands-on practice at clinical attachment

Readings

Observations

Demonstrations

Practicals

Competency assessment

Assessment strategy

A continuous assessment, clinical attachment checklist, clinical attachment report, and a practical examination to evaluate the trainee's technical, practical, and research skills, clinical competencies, attitude, and knowledge needed for optimal performance in a histopathology/cytopathology department.

Assessment patterns

Continuous assessment 60%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, histopathology/cytopathology laboratory premises equipment, supplies, training materials, and standard operating procedures (SOPs), computers, printers, and textbooks.

Required text

Koss, L.G. and Melamed, M.R. (2005) *Koss' Diagnostic Cytology and its Histopathologic Bases*. 5th Ed. Philadelphia, PA: Lippincott, Williams, and Wilkins. ISBN/ISSN: 9780781719285.

Eroschenko, V. P. (2000) *di Fiore's Atlas of Histology with Functional Correlations*. 9th Ed. Philadelphia, PA: Lippincott Williams & Wilkins

Recommended reading

Cibas, E. S. & Ducatman, B. S. (2014) *Cytology Diagnostic Principles and Clinical Correlates*. 4th Ed. Philadelphia, PA: Elsevier. ISBN 9781455744626

Kargar. *Acta Cytologica: Current Issues of the Journal of Clinical Cytology and Cytopathology*. [Online] Available from: <http://www.karger.com/Journal/Home/254338>. [Accessed: 5th July 2014].

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 3043 Clinical Blood Transfusion Science III (6 credits, 100 hours)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course provides the learner with an opportunity to gain experience as a trainee during clinical rotations in a blood transfusion service within a healthcare setting. The learner will be assessed in the competencies acquired while undergoing supervised training in each section of the blood transfusion service. During this clinical placement, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies acquired.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is for the learner to acquire specialised skills and clinical competencies needed for independent work and optimal performance in a blood transfusion service within a healthcare setting.

Learning objectives

At the end of Year 3 first semester the learner will be able to:

1. Apply knowledge for the appropriate collection, handling, and processing of patient specimens
2. Comply with the medical laboratory's safety standards
3. Comply with the standard operating procedures
4. Apply quality control and quality assurance methods in all areas of the clinical attachment

5. Successfully complete all competencies listed in the clinical attachment logbook
6. Demonstrate appropriate ethical and professional conduct
7. Communicate effectively with peers and other health practitioners
8. Perform laboratory procedures effectively and efficiently under the direct supervision of a qualified laboratory professional in all areas of the clinical attachment
9. Conduct a literature review of current trends in blood transfusion medicine
10. Critique patient case studies in blood transfusion medicine
11. Complete and present the blood transfusion clinical attachment report

Content

Clinical Placement

Clinical competencies

Logbook

Lab practice

Skill development

Communication

Professionalism

Biomedical ethics

Literature review

Case studies

Clinical attachment report

Teaching and learning strategies

Self-directed learning

Hands-on practice at clinical attachment

Readings

Observations

Demonstrations

Practicals

Competency assessment

Assessment strategy

A continuous assessment, clinical attachment checklist, clinical attachment report and practical examination to evaluate the learner's technical and practical skills, clinical competencies, attitude, and knowledge needed for optimal performance in a blood transfusion service.

Assessment patterns

Continuous assessment 60%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, blood transfusion center premises equipment, supplies, training materials, standard operating procedures (SOPs), computers, printers, and textbooks.

Required texts

Blaney, K. D. and Howard, P.R. (2012) *Basic & Applied Concepts of Blood Banking and Transfusion Practices*. Philadelphia, PA: Elsevier. ISBN 9780323086639.

World Health Organization. (2014) *10 Facts on Blood Transfusion*. [Online] Available from: http://www.who.int/features/factfiles/blood_transfusion/en/. [Accessed 3rd July 2014].

Recommended reading

Archive of Blood Transfusion Articles. [Online] Available from:

<http://www.ncbi.nlm.nih.gov/pmc/journals/669/>. [Accessed: 3rd July 2014].

Rudman, S. V. (2005) *Blood Banking and Transfusion Medicine*. 2nd Ed. Philadelphia, PA: Elsevier Saunders. ISBN 9780721603841

Journal of Blood Transfusion. [Online] Available from:

<http://www.hindawi.com/journals/jbt/>. [Accessed: 3rd July 2014].

Grading

Marks	Letter Grade
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85 & above	A
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75-84	B
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65-74	C
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50-64	D
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49 & below	F
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Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 3044 Medical Parasitology/Entomology III (6 credits, 100 hrs)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course provides the learner with an opportunity to gain experience as a trainee during clinical rotations in a medical parasitology/entomology department within a healthcare setting. The learner will be assessed in the competencies acquired while undergoing supervised training in each section of the department. During this clinical placement, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies acquired.

Pre-requisites: Departmental approval and supervisor's approval at clinical attachment site/s

Aim

The aim of this course is for the learner to acquire specialised skills and clinical competencies needed for independent work and optimal performance in a medical parasitology/entomology department within a healthcare setting.

Learning objectives

At the end of Year 3 first semester the learner will be able to:

1. Apply knowledge for the appropriate collection, handling, and processing of patient specimens
2. Comply with the medical laboratory's safety standards
3. Follow the general laboratory operations
4. Comply with the standard operating procedures
5. Apply quality control methods in all areas of the clinical attachment

6. Successfully complete all competencies listed in the clinical attachment logbook
7. Demonstrate appropriate ethical and professional conduct
8. Communicate effectively with peers and other health practitioners
9. Perform laboratory procedures effectively and efficiently under the direct supervision of a qualified laboratory professional in all areas of the clinical attachment
10. Conduct a literature review of current trends in medical parasitology/entomology
11. Critique patient case studies in medical parasitology/entomology
12. Complete and present the clinical attachment report

Content

Clinical Placement

Clinical competencies

Logbook

Lab practice

Skill development

Communication

Professionalism

Biomedical ethics

Literature review

Case studies

Clinical attachment report

Teaching and learning strategies

Self-directed learning

Hands-on practice at clinical attachment

Readings

Observations

Demonstrations

Practicals

Competency assessment

Assessment strategy

A continuous assessment, clinical attachment checklist, clinical attachment report, and a practical examination to evaluate the learner's technical, practical, and research skills, clinical competencies, attitude, and knowledge needed for optimal performance in a medical parasitology/entomology department.

Assessment patterns

Continuous assessment 60%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, parasitology/entomology laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, printers, and textbooks.

Required text

John, D.T. & Petri, W.A. (2006) *Markell and Voge's Medical Parasitology*. 9th Ed. St. Louis, MO: Saunders Elsevier. ISBN 9780721647937

Recommended reading

CDC. (n.d.) *Laboratory Identification of Parasitic Diseases of Public Health Concern*. [Online] Available from: <http://www.dpd.cdc.gov/dpdx/>. [Accessed: 3rd July 2014].

Prasad, K.J. (2010, March) *Emerging and Re-emerging Parasitic Diseases*. [Online] Available from: <http://medind.nic.in/jav/t10/i11/javt10i1p45.pdf>. [Accessed: 3rd July 2014].

Anamo, Z and Baraki, N. (2008) *Medical Entomology*. [Online] Available from: http://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_students/MedicalEntomology.pdf. [Accessed: 3rd July 2014].

Grading

Marks	Letter Grade
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85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

MLS 3045 Clinical Immunology and Virology III (6 credits, 100 hours)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Clinical Attachment Site and Rotation Department

Supervisor's information

Course description

This course provides the learner with an opportunity to gain experience as a trainee during clinical rotations in an immunology/virology department within a healthcare setting. The learner will be assessed in the competencies acquired while undergoing supervised training in each section of the department. During this clinical placement, practical logbooks will be used and signed by the supervisor/s and learner to demonstrate learner competencies acquired.

Pre-requisites: Departmental approval and supervisor's approval at the clinical attachment site/s

Aim

The aim of this course is for the learner to acquire specialised skills and clinical competencies needed for independent work and optimal performance in an immunology/virology department within a healthcare setting.

Learning objectives

At the end of Year 3 first semester the learner will be able to:

1. Apply knowledge for the appropriate collection, handling, and processing of patient specimens
2. Comply with the medical laboratory's safety standards
3. Comply with the standard operating procedures
4. Apply quality control and quality assurance methods in all areas of the clinical attachment

5. Successfully complete all competencies listed in the clinical attachment logbook
6. Demonstrate appropriate ethical and professional conduct
7. Communicate effectively with peers and other health practitioners
8. Perform laboratory procedures effectively and efficiently under the direct supervision of a qualified laboratory professional in all areas of the clinical attachment
9. Conduct a literature review of current trends in immunology/virology
10. Critique patient case studies in immunology/virology
11. Complete and present the clinical attachment report

Content

Clinical Placement

Clinical competencies

Logbook

Lab practice

Skill development

Communication

Professionalism

Biomedical ethics

Literature review

Case studies

Clinical attachment report

Teaching and learning strategies

Self-directed learning

Hands-on practice at clinical attachment

Readings

Observations

Demonstrations

Practicals

Competency assessment

Assessment strategy

A continuous assessment, clinical attachment checklist, a clinical attachment report, and a practical examination to evaluate the trainee's technical, practical, and research skills, clinical competencies, attitude, and knowledge needed for optimal performance in an immunology/virology department.

Assessment patterns

Continuous assessment 60%

Clinical attachment report 40%

Teaching and learning resources

Trainer's manual, trainer's notes, study guides, access to Internet and library, clinical immunology/virology laboratory premises, equipment, supplies, training materials, and standard operating procedures (SOPs), computers, and textbooks.

Required text

Peakman, M. and Vergani, D. (2009) *Basic and Clinical Immunology*. 2nd Ed. St. Louis, MO: Elsevier. ISBN 9780443100826

Reiss, C. S. Ed (2009) *Principles and Practices of Clinical Virology*. 6th Ed. Hoboken, NJ: Wiley-Blackwell. ISBN 9780470517994

Recommended reading

Wood, P. (2012) *Understanding Immunology*. 3rd Ed. Canada: Pearson Education. ISBN 9780273730682

Lima, V. (2013) *Virology Clinical Cases*. [Online] Available from:

<http://www.sci.ccny.cuny.edu/~lima/case7.html>. [Accessed: 6th July 2014].

Lima, V. (2013) *Immunology Clinical Cases*. [Online] Available from:

<http://www.sci.ccny.cuny.edu/~lima/immunology.html>. [Accessed: 6th July 2014].

Grading

Marks	Letter Grade
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85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Clinical Attachment Site Policies

Classwork Schedule Outline/Dates

Clinical Attachment Schedule Outline/ Dates

SDS 3046 Self-Directed Study V (6 credits, 100 hours)

Year 3, Semester 1 (Lecture 50 hours; Practical 50 hours)

Instructor Information

Course description

This course provides the learner an opportunity to independently explore a special biomedical science topic of interest, under the advisement of the instructor who will monitor and critique the learner's progress. The course may be taken for 1 to 6 credits, with department approval. The course may be repeated for credit with a change of topic.

Pre-requisites: A qualified tutor to act as course instructor. Instructor approval

Aim

The aim of this course is to enable the learner to acquire working knowledge and research skills in the exploration of a specific biomedical science topic of interest to the learner.

Learning objectives

Since this is self-directed study, there must be agreement between the learner and the instructor as to the learning objectives and the final product. The study must be completed in the semester taken.

Teaching and learning strategy

Self-directed learning

Assessment strategy

To be determined by the instructor

Assessment patterns

To be determined by the instructor

Teaching and learning resources

Access to the Internet and library, handouts, LCD projector, overhead projector, computers and printers.

Required text

Backer, J. R. and Brizee, A. (Eds.) (2013) *Writing a Research Paper* [Online] Available from: <https://owl.english.purdue.edu/owl/resource/658/01/>. [Accessed: 2nd July 2014].

Recommended text

HARVARD Reference Style Guide

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

Course Schedule Outline/Due Dates

14.6 Year 3, Semester 2

RPR 3047: Research Project I (10 credits, 360 hrs)

Year 3, Semester 2 (Lecture 180 hours; Practical 180 hours)

Instructor information

Course description

This course focuses on the selection of a research topic and the development of an approved biomedical research-based proposal of scientific merit and suitable for publication. The learner will receive guidance, supervision, and support throughout the research process.

Prerequisites: Successful completion of the diploma programme courses and an advisor/supervisor appointed by the Medical Laboratory Sciences Department

Aim

The aim of this course is to equip the learner with the essential research and writing skills needed to develop and implement a biomedical research- based project of scientific merit.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Collaborate with the supervisor to choose a research topic and gain his/her approval
2. Schedule regular meetings with the supervisor for guidance throughout the research process
3. Construct an outline of the proposed research for supervisor approval
4. Compose a research question and hypothesis of an experimental study
5. Define a clear problem statement, research questions, and hypotheses for the proposed research study

6. Conduct a review of the research literature in the medical laboratory science disciplines
7. Gain site permission from the source to conduct the proposed study
8. Choose a sample population from which to collect the data
9. Describe the procedures for data collection and analysis
10. Write a research proposal for supervisor approval
11. Present an executive summary of the proposal in a structured format
12. Submit the approved research study for departmental approval

Content

Literature review

Research proposal

Problem statement

Research questions and hypotheses

Research design

Sample population

Data collection and data analysis methods

Significance of the study

Scientific writing

Abstracts

Teaching and learning strategies

Advisor guidance and supervision

Self-directed learning

Readings

Assessment strategy

A research outline and a proposal to assess learner's knowledge of the dimensions of scientific research, the learner's research and critical thinking skills, and the level of written and oral communication skills.

Assessment patterns

Topic outline 30%
Oral Presentation 30%
Research Proposal 40%

Teaching and learning resources

Peer-reviewed articles and journals, textbooks, access to Internet and library.

Required text

Leedy, P. and Ormrod, J. (2009) *Practical Research: Planning and Design*. 9th Ed. Upper Saddle River, NJ: Pearson

Recommended reading

African Journals Online. <http://www.ajol.info>

HINARI Research in Health. <http://www.who.int/hinari/en/>

Varkevisser, C. M., Pathmanathan, I, and Brownlee, A (2003) *Designing and conducting health systems research projects volume I: Proposal development and fieldwork*. WHO/IDRC. [Online]Available from:

<http://www.idrc.ca/EN/Resources/Publications/Pages/IDRCBookDetails.aspx?PublicationID=210>. e-ISBN: 1-55250-069-1. [Accessed: 20th August 2014].

Harvard Reference Style Guide

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

RPR3048: Research Project II (10 credits, 440 hours)

Year 3, Semester 2 (Lecture 220 hours; Practical 220 hours)

Instructor information

Course description

This course focuses on the implementation and write-up of a biomedical research-based project of scientific merit with supervisor and department approval.

Prerequisites: Successful completion of RPR 3037 Research Project I and a designated advisor/supervisor appointed by the Medical Laboratory Sciences Department

Aim

The aim of this course is to conduct and execute an approved biomedical research project, write a final report, and present the findings of the research project.

Learning objectives

Upon completion of this course, the learner will be able to:

1. Schedule regular meetings with the supervisor for guidance throughout the research process
2. Implement the research study upon successful completion of the approval process
3. Prepare a final research report aligned with the format of scientific journals
4. Submit the complete final research project for supervisor review and approval
5. Revise the document based on any and all corrections requested by the supervisor
6. Submit the final research project to the Medical Laboratory Sciences Department for approval
7. Prepare and present an oral presentation of the research project in a structured format

Content

Literature review

Problem statement
Research questions and hypotheses
Research design
Sample population
Data collection and data analysis
Significance of the study
Assumptions and limitations
Conclusions and findings
Recommendations for further research
Research Project

Teaching and learning strategies

Lectures
Small group discussions
Assignments
Demonstrations
Observations
Self-directed learning
Readings

Assessment strategy

A final research project write-up and oral presentation to assess the learner's knowledge of the dimensions of scientific research, the level of writing a final research report, and the level of written and oral communication skills.

Assessment patterns

Presentation 60%
Research Project Write-up 40%

Teaching and learning resources

Textbooks, peer-reviewed journals, and access to Internet and library

Required text

Creswell, J.W. (2009) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 3rdEd. Thousand Oaks, CA: Sage

Recommended reading

African Journals Online. <http://www.ajol.info>

Elliott, A. C. & Woodward, W.A. (2007) *Statistical Analysis Quick Reference Guidebook: With SPSS Examples*. Thousand Oaks, CA: Sage

HINARI Research in Health. <http://www.who.int/hinari/en/>.

Varkevisser, C. M., Pathmanathan, I, & Brownlee, A (2003) *Designing and Conducting Health Systems Research Projects Volume I: Proposal Development and Fieldwork*.

WHO/IDRC. [Online] Available from:

<http://www.idrc.ca/EN/Resources/Publications/Pages/IDRCBookDetails.aspx?PublicationID=210>. e-ISBN: 1-55250-069-1. [Accessed: 20th August 2014].

Harvard Reference Style Guide

Grading

Marks	Letter Grade
85 & above	A
75-84	B
65-74	C
50-64	D
49 & below	F

Attendance policy

A student is expected to attend at least 90% of the teaching and learning sessions in this course in order to qualify for the final qualifying examination.

Institutional policies

Academic Integrity

Students with Disabilities

15.0 Registration and Licensing

It is recommended that after successful completion of the Diploma programme in Medical Laboratory Sciences and passing the prerequisite assessments and examinations, the Medical Laboratory Technologist will be registered to practice and deliver laboratory services to the people of South Sudan. The Ministry of Health, Government of South Sudan through appropriate body, will carry out registration and licensing of Medical Laboratory Technologists. The Ministry of Health will undertake to provide qualified Medical Laboratory Technologists with appropriate uniforms, badges and any other necessary identification. Furthermore, the Ministry of Health and partners in health care delivery in South Sudan, will endeavour to put in place mechanisms for supervising Medical Laboratory Technologists during their professional practice and will provide and replenish supplies and equipment required for delivering quality laboratory services. The Ministry of Health will also design a career development pathway through which the Medical Laboratory Technologists will pursue Continuing Professional Development/Medical Education (CPD/CME).

16.0 Curriculum review and change

The Diploma curriculum for training Medical Laboratory Technologists is a dynamic one and is implemented in a dynamic environment. Global trends as well as changes in the health situation in South Sudan will, of necessity, require that the implementation of this curriculum be constantly monitored for relevance and be reviewed and changed through evidenced-based practice. The monitoring framework provided with this curriculum will be used as a guide. It is incumbent upon the Ministry of Health, training schools and relevant stakeholders to review the curriculum regularly. It is recommended that the first review be carried out after the sixth cohort of qualified Medical Laboratory Technologists has graduated.

APPENDICES

Appendix 1: Training Standards

STAFF /STUDENT RATIO

1. Lecturers

- Theory 1:10
- Practical 1:5

2. Support staff

- Technologist (Diploma Level) one (1)
- Technicians two (2)

3. Academic staff qualifications

Minimum Bachelor of MLS with three (3) years' experience plus Certificate in Medical Education or

Masters in relevant Medical Laboratory subjects with five (5) years working experience and an excellent track record

4. Attendance: 90%

5. Duration of programme: Three (3) years

6. Distribution of learning time: Theory 40%; Practical 60%

7. Subjects taken: All

8. Average pass mark: 50 %

9. Examination declaration:

A common examination will be given to all students. Examination results must be declared two weeks after the last paper

Appendix 2: Essential Laboratory Equipment

MICROBIOLOGY COURSES

1. Autoclave (portable)	1 between 10 students
2. Medium water baths	1 between 5 students
3. pH meters	1 between 5 students
4. Anaerobic jars	1 between 5 students
5. Incubators/hot air oven	1 between 10 students
6. Distillation units	2 for the whole institution
7. De-ionisers	2 for the whole institution
8. Microscopes binocular	1 between 5 students
9. Weighing balance	1 top pan load balance
10. Wood's lamp	1 per institution
11. Centrifuges	1 between 4 students
12. Bunsen burners/spirit lamps	1 between 2 students
13. Tripod stands/asbestos mats	1 between 10 students
14. Refrigerators/freezers	1 between 10 students
15. Safety cabinet	1 per laboratory
16. Teaching microscopes	1 between 10 students
17. Mechanical shakers	1 between 10 students
18. Inoculating loops	1 per student
19. Assorted microbiology glassware	adequate

CHEMISTRY COURSES

1. Colorimeters	1 between 4 students
2. Analytical balance – top pan loading; Sensitivity up to 1mg	1 between 5 students
3. Flame photometers	1 between 10 students
4. Centrifuge	1 between 4 students
5. Refrigerators/ freezers	1 between 10 students
6. Water baths, medium	1 between 4 students

7. pH meters	1 between 5 students
8. Mechanical mixers	2 per institutions/class
9. Electrophoresis equipment	2 per institution/class
10. Distillation unit /Deioniser	2 per institution/class
11. Hot air oven / incubator adjustable	10 per institutions /class
12. Flame photometer	1 between 5 students
13. Ion selective electrodes	2 per institution/class
14. Electrophoresis equipment	1 between 10 students

HAEMATOLOGY COURSES

1. Haemoglobinometers	1 between 5 students
2. Centrifuges	1 between 5 students
3. Microhaematocrit centrifuges	1 between 5 students
4. Microscopes	1 between 5 students
5. Blood mixers rollers	1 between 10 students
5. Water baths	1 between 5 students
6. Incubators	1 between 5 students
7. Colorimeters	1 between 5 students
8. Electrophoresis equipment	1 between 10 students
9. Sphygmomanometers	1 between 5 students
10. ESR stands	1 between 4 students
11. Refrigerators/freezers	1 per 10 students
13. Electronic blood cell counters	1 for each class
14. Neubauer chambers	1 for each student
15. Distillation units	2 per institution/class
16. Analytical balances	1 between 10 students
18. Spectroscope-Direct vision	
19. Refrigerated centrifuge	

HISTOPATHOLOGY AND CYTOPATHOLOGY COURSES

1. Microtomes, rocking /rotary	1 per 4 students
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2. Manual tissue processing sets	1 between 4 students
3. Hot plates	1 between 6 students
4. Hones and strops	1 between students
5. Automatic knife sharpeners	1 per class/institution
6. Water baths, medium size	1 between 4 students
7. Microscope (teaching)	1 for the institution
8. Cold plates	1 between 6 students
9. Weighing balances	1 between 5 students
10. Deionisers	1 per class/institution
11. Fume chamber	1 per laboratory/institution
12. Automatic tissue processor	1 per class/institution
13. Automatic staining machine	1 per class/institution
14. Freezing microtome – hard set	1 per class/institution
15. Centrifuges	1 per class /institution

BLOOD TRANSFUSION SCIENCE COURSES

1. Blood bank refrigerator	1 per class/institution
2. Grouping tiles	1 per student
3. Water baths, adjustable (medium size)	1 between 15 students
4. Plasma extractors	1 between 15 students
5. Centrifuges	1 between 4 students
6. Weighing balances	1 between 5 students
7. Sphygmomanometer	1 between 5 students
8. Hot air oven (adjustable)	1 per institution
9. De-ionisers and Distillation Units	1 per institution
10. Mechanical shakers	2 per institution
12. Assorted blood transfusion glassware and adequate apparatus	-
13. Microscopes	1 per student
14. Deep freezer 70°C	1 per institution
15. Automated centrifuge for blood products	1 per institution

16. Cool boxes -

MEDICAL PARASITOLOGY AND ENTOMOLOGY COURSES

- | | |
|---|----------------------|
| 1. Microscopes | 1 between 4 students |
| 2. Centrifuges | 1 between 4 students |
| 3. Refrigerators | 1 between 4 students |
| 4. Pestles and mortars | 1 per student |
| 5. Teaching microscope | - |
| 6. QBC unit | - |
| 7. Assorted apparatus e.g. sieves, racks, tests tubes stirring rods, applicator sticks, forceps, funnels,
Kato kits, hand lenses | - |
| 8. Stereo microscope/dissecting microscope | 1 per class |
| 9. Fluorescent microscope | 1 per class |
| 10. Geiger Muller counter/scintillator | - |

IMMUNOLOGY AND VIROLOGY COURSES

1. Hepatitis screening equipment
2. HIV screening equipment
 - i) Elisa
 - ii) Immunoblots (Western Blot)
3. PCR (polymerase chain reaction) instrument
4. CD4 /CD8 counting machine
5. Tissue lines
6. Immunofluorescence equipment
7. Inverted microscope
8. Mechanical shakers
9. Centrifuges
10. Water baths
11. Refrigerators
12. Chromatographic sets

- i. Gas Liquid Chromatography
 - ii. High Pressure Liquid Chromatography
 - iii. Thin Layer Chromatography
13. Thermocycler

Appendix 3: Essential Books and Electronic References

Chemistry

Lower, S. *Chem1 Virtual Textbook: A Reference text for General Chemistry*. [Online]

Available from:

<http://www.chem1.com/acad/webtext/virtualtextbook.html>. [Accessed: 2nd July 2014].

Saylor Foundation. *General Chemistry: Principles, Patterns, and Applications*. [Online]

Available from:

<http://www.saylor.org/site/textbooks/General%20Chemistry%20Principles,%20Patterns,%20and%20Applications.pdf>. [Accessed: 2nd July 2014].

Computer Application to Laboratory Practice

O'Leary, T.J. and O'Leary, L.I. (2007) *Computing Essentials*. Washington, DC:

McGraw-Hill Higher Education. ISBN: 978-0-07-351670-7.

ceUCLA. *Introduction to SAS*. UCLA: Statistical Consulting Group. [Online] Available

from: <http://www.ats.ucla.edu/stat/sas/notes2/>. [Accessed: 5th July 2014].

Entrepreneurship Education

Pinkett, R. (2007) *Campus CEO: The Student Entrepreneur's Guide to Launching a Multi-Million-Dollar Business*. Chicago, IL: Kaplan Publishing. ISBN 9781419593710.

Prentice-Hall, Inc. *Small Business and Entrepreneurship Resources* [Online]. Available

from: <http://www.prenhall.com/scarbzim/html/resource.html>. [Accessed: 2nd July 2014].

Human Anatomy and Physiology

Marieb, E. N. and Hoehn, K. (2012) *Anatomy and Physiology*. 9th Ed. [Online] Available

from: <http://humananatomypdf.wordpress.com>. [Accessed: 7th July 2014].

Scanlon, V.C. and Sanders, T.(2007) *Essentials of Anatomy and Physiology*. 5th Ed. [Online] Available from: http://kepstikma.files.wordpress.com/2011/05/f-a-davis_-_essentials-of-anatomy-and-physiology-2007.pdf. [Accessed: 7th July 2014).

Laboratory Instrumentation

Hong, C. (2010) *Clinical Laboratory Instrumentation*. [Online]. Available from: https://courses.washington.edu/bioen302/Lecture/302Lect_LabInstrumentation.pdf. [Accessed: 7th July 2014).

World Health Organization (2003) *Manual of Basic Techniques For a Health Laboratory*. 2nd Ed. [Online] Geneva: World Health Organization. Available from: <http://apps.who.int/medicinedocs/documents/s16537e/s16537e.pdf>. [Accessed: 7th July 2014].

Health Service Management

Boo yens, S.W. (2008) *Introduction to Health Services Management*. 3rd Ed. Cape Town, ZA: Juta Academic.

Itika, J. (2011) *Fundamentals of Human Resource Management: Emerging Experiences from Africa*. [Online] Available from: <https://openaccess.leidenuniv.nl/handle/1887/22381>. [Accessed: 8th July 2014].

World Health Organization. (2006) *Quality of Care: A Process for Making Strategic Choices in Health Systems*. [Online] Available from: http://apps.who.int/iris/bitstream/10665/43470/1/9241563249_eng.pdf?ua=1. [Accessed: 8th July 2014].

Laboratory Management Practice

Clinical and Laboratory Standards Institute. [Online] Available from: <http://www.clsi.org>. [Accessed: 7th July 2014].

Harmening, D.M. (ed.) (2013) *Laboratory Management: Principles and Processes*. 3rd Ed. St. Petersburg, FL: D. H. Publishing & Consulting, Inc.

WHO (2003) *Manual of Basic Techniques For a Health Laboratory*. [Online] Available from: <http://apps.who.int/medicinedocs/documents/s16537e/s16537e.pdf>. [Accessed: 7th July 2014].

Mathematics and Biostatistics

Doucette, L. J. (2011) *Mathematics for the Clinical Laboratory*. 2nd Ed. Maryland Heights, MO: Saunders/Elsevier.

Illowsky, B., and Dean, S. (2012, July 3) *Collaborative Statistics*. OpenStax-CNX [Online] Available from: <http://cnx.org/content/col10522/1.40/>. [Accessed: 7th July 2014].

Medical Terminology

Cohen, B. J. (2013) *Medical Terminology: An illustrated Guide*. 7th Ed. Philadelphia, PA: Lippincott, Williams, and Wilkins. ISBN 978-1451187564

The Heritage Medical Dictionary. *Medical Dictionary* [Online] Available from: <http://dictionary.reference.com/medical/>. [Accessed: 7th July 2014].

Research Methods and Research Projects

African Journals [Online] Available from: <http://www.ajol.info/>. [Accessed 20th August 2014].

A Harvard Reference Style Guide

Elliott, A. C. and Woodward, W.A. (2007) *Statistical Analysis Quick Reference Guidebook: With SPSS Examples*. Thousand Oaks, CA: Sage

Bradford University School of Management. *An Introduction to Research & Research Methods*. [Online] Available from:
<http://www.brad.ac.uk/management/media/management/els/Introduction-to-Research-and-Research-Methods.pdf>. [Accessed: 7th July 2014].

HINARI Research in Health . [ONLINE] Available from: <http://www.who.int/hinari/en/>. [Accessed 20th August 2014].

Kumar, R. (2010) *Research Methodology: A Step-by-Step Guide for Beginners*. 3rd Ed. London, England: Sage Publications. ISBN 978-1-84920-301-2

Leedy, P. and Ormrod, J. (2009) *Practical Research: Planning and Design* 9th Ed. Upper Saddle River, NJ: Pearson

Varkevisser, C. M., Pathmanathan, I, & Brownlee, A (2003). *Designing and conducting health systems research projects volume 1: Proposal development and fieldwork*. WHO/IDRC. [Online] Available from:
<http://www.idrc.ca/EN/Resources/Publications/Pages/IDRCBookDetails.aspx?PublicationID=210>. e-ISBN: 1-55250-069-1. [Accessed: 20th August 2014].

Social Studies, Medical Ethics, and Law

Hall, M.A., Ellman, I.M. and Orentlicher (2013) *Health Care Law and Ethics*. St Paul, MN: West Academic. ISBN 9780314209870.

Republic of South Sudan Public Health Act

Constitution of Association of South Sudan Medical Laboratory Professionals
Republic of South Sudan Medical Laboratory Technicians and Technologists Act

Laboratory Safety

CDC and National Institutes of Health (2009). *Biosafety in Microbiological and Biomedical Laboratories*. 5th Ed. [Online] Available from:
<http://www.cdc.gov/biosafety/publications/bmb15/BMBL.pdf>.
[Accessed: 2nd July 2014].

Occupational Safety and Health Administration. *Occupational Exposure to Hazardous Chemicals in Laboratories*. [Online] Available from:
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10106. [Accessed: 2nd July 2014].

Histopathology, Cytopathology, Clinical Histopathology, Clinical Cytopathology
Bancroft, J. D. and Gamble, M. (2008) *Theory and Practice of Histological Techniques*. 6th Ed. Philadelphia, PA: Churchill Livingstone Elsevier.

Carson, F. L. (2009) *Histotechnology, a Self-instructional Text*. 3rd Ed. Chicago, Illinois: ASCP Press. ISBN 0-89189-581-7

Cibas, E. S. and Ducatman, B. S. (2014) *Cytology Diagnostic Principles and Clinical Correlates*. 4th Ed. Philadelphia, PA: Elsevier. ISBN 9781455744626

Eroschenko, V. P. (2000). *di Fiore's Atlas of Histology with Functional Correlations*. 9th Ed. Philadelphia, PA: Lippincott Williams & Wilkins

Holladay, B. (2009) *Cytopathology Review Guide*. 3rd Ed. Chicago, Illinois: American Society for Clinical Pathology Press. ISBN-13:978-0891895596

Kargar. *ActaCytologica: Current Issues of the Journal of Clinical Cytology and Cytopathology*. [Online] Available from:

<http://www.karger.com/Journal/Home/254338>. [Accessed: 5th July 2014].

Klernan, J. (2000) *Histological and Histochemical Methods: Theory & Practice* 3rd Ed.

Florence, Kentucky: Taylor & Francis. ISBN 9780750649360

Koss, L.G. & Melamed, M.R. (2005) *Koss' Diagnostic Cytology and its Histopathologic Bases* 5th Ed. Philadelphia, PA: Lippincott, Williams, and Wilkins. ISBN/ISSN: 9780781719285

Immunology and Virology

Delves P.J, Martin, S.J. Burton, D.R. & Roitt, I.M. (2011) *Roitt's Essential Immunology*. 12th Ed. Hoboken, New Jersey: Blackwell Publishing.

Essentials of Clinical Immunology Case Studies. [Online] Available from: <http://www.immunologyclinic.com/CaseIndex.asp>. [Accessed: 5th July 2014]

Fraenkel-Conrat, H. Ed. (2011) *Comprehensive Virology: Volume 15: Virus-Host Interactions Immunity to Viruses*. New York, NY: Springer Publishing.

Isaacs, D. (2013, May) *Clinical Cases in Virology*. [Online] Available from: <http://www.rcpa.edu.au/getattachment/47a2cb2e-77a4-4377-aac3-7df8f8851c57/Dr-Davis-Isaacs-Clinical-cases-in-virology.aspx>. [Accessed: 5th July 2014].

Lima, V. (2013) *Virology Clinical Cases*. [Online] Available from: <http://www.sci.ccny.cuny.edu/~lima/case7.html>. [Accessed: 6th July 2014].

Lima, V. (2013) *Immunology Clinical Cases*. [Online] Available from: <http://www.sci.ccny.cuny.edu/~lima/immunology.html>. [Accessed: 6th July 2014].

Male, D. (2012) *Immunology* 8th Ed. St. Louis, MO: C.V. Mosby. ISBN 9780323080583.

Peakman, M. & Vergani, D. (2009) *Basic and Clinical Immunology*. 2nd Edition. St. Louis, MO: Elsevier. ISBN 9780443100826

Reiss, C. S. Ed (2009) *Principles and Practices of Clinical Virology*. 6th Ed. Hoboken, NJ: Wiley-Blackwell. ISBN 9780470517994

Wood, P. (2012) *Understanding Immunology*. 3rd Ed. Canada: Pearson Education. ISBN 9780273730682

Zuckerman (2004) *Principles and Practice of Clinical Virology*. 5th Ed. Hoboken, New Jersey: Wiley Blackwell. ISBN-13:978-0470843383

Public Health and Epidemiology

CDC. *Epidemiologic Case Studies*. [Online] Available from: <http://www.cdc.gov/epicasestudies/>. [Accessed: 9th July 2014].

Joseph, V.V. *Public Health and Health Policy in South Sudan*. [Online] Available from: <http://www.southsudanmedicaljournal.com/archive/2008-02/public-health-and-health-policy-in-south-sudan.html>. [Assessed: 9th July 2014].

Ministry of Health, Republic of South Sudan. [Online] Available from: <http://www.mohss.org>. [Assessed: 9th July 2014].

Self-Directed Study

Backer, J. R. and Brizee, A. (eds.) (2013) *Writing a Research Paper*. Purdue University Owl Online Writing Lab. [Online] Available from: <https://owl.english.purdue.edu/owl/resource/658/01/>. [Accessed: 2nd July 2014].

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Microbiology (Bacteriology and Mycology), and Clinical Microbiology

Alcama, E. (2001) *Fundamentals of Microbiology*. 6th Ed. Boston, MA: Jones and Bartlett Publishers. ISBN: 0-7637-1067-9

Berman, J. (2009) *WHO: Waterborne Disease is World's Leading Killer*. [Online] Available from: <http://www.voanews.com/content/a-13-2005-03-17-voa34-67381152/274768.html>. [Accessed: 6th July 2014].

Cheesbrough, M. (2006) *District Laboratory Practice in Tropical Countries: Part 1*. 2nd Ed. United Kingdom: Cambridge University Press. ISBN 9780521684583

Cheesbrough, M. (2006) *District Laboratory Practice in Tropical Countries: Part 2*. 2nd Ed. United Kingdom: Cambridge University Press. ISBN 9780521676311

Forbes, B.A., Sahm, D. F. and Weissfeld, A.S. (2007) *Bailey & Scott's Diagnostic Microbiology* 12th Ed. Maryland Heights, MO: C. V. Mosby. ISBN: 9780323030656

Greenwood, D. Slack, R.C. B, Peutherer, J. F. & Barer, M.R. (2007) *Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control*. 17th Ed. Philadelphia, PA: Elsevier Health. ISBN 9780443102097

Larone D.H. (2002) *Medically Important Fungi: a Guide to Identification*. Herndon, VT: ASM Press.

Ryan, K.J. & Ray, C.G. (2010) *Sherris Medical Microbiology* 5th Ed. New York, NY: McGraw Hill Medical. ISBN-13:978-0071604024

Society for General Microbiology Journals Online. [Online] Available from: <http://intl.sgmjournals.org>. [Accessed: 2nd July 2014].

South African Society for Microbiology. [Online] Available from: <http://sasm.org.za>. [Accessed: 3rd July 2014].

Todar, K. *Online Textbook of Bacteriology*. [Online] Available from: <http://www.textbookofbacteriology.net>. [Accessed: 2nd July 2014].

Analytic Chemistry and Biochemistry, Clinical Chemistry

Arneson, W. (2013) *Study Guide for clinical Chemistry: A Laboratory Perspective*. Ventura, CA: Academic Internet Publishers. ISBN 9781478492238

Australasian Association of Clinical Biochemists. *Clinical Chemistry Clinical Case Studies*. [Online] Available from:

http://oldsite.aacb.asn.au/web/Education/Clin_Chem_Clinical_Case_Studies/.

[Accessed: 2nd July 2014].

Biochemical Journal. [Online] Available from: <http://www.biochemj.org/bj/default.htm>.

[Accessed: 8th July 2014].

Bishop, M.L., Fody, E. P. & Schoeff, L.E. (2005) *Clinical Chemistry: Principles, Procedures, Correlations*. Baltimore, MD: Lippincott Williams & Wilkins Publishers. ISBN 0-7817-4611-6

Devlin, T. M. (2010) *Textbook of Biochemistry with Clinical Correlations*. Hoboken, NJ: John Wiley & Sons.

Harris, D. C. (2006) *Quantitative Chemical Analysis*. 8th Ed. United Kingdom: W. H. Freeman and Company. ISBN 9781429218153

International Journal of Analytical Chemistry. [Online] Available from:

<http://www.hindawi.com/journals/ijac/>. [Accessed: 8th July 2014].

Makowski, G. (2009) *Advances in clinical chemistry*. St. Louis, MO: Elsevier. Print Book ISBN 9780123747969; eBook ISBN 9780080950983

Haematology and Clinical Haematology

African Journal of Health Sciences. [Online] Available from:
<http://www.ajol.info/index.php/ajhs>. [Accessed: 2nd July 2014].

African Journal of Laboratory Medicine. [Online] Available from:
<http://www.ajlmonline.org/index.php/ajlm>. [Accessed: 2nd July 2014].

Anderson, S. & Poulsen, K.B. (2013) *Anderson's Atlas of Hematology*. Philadelphia, PA: Lippincott Williams & Wilkins. ISBN/ISSN: 9781451131505

Bolton-Moggs, P.H.B., Perry, D. J., Chalmers, E.A., Parapet, L.A., Wilde, J. T., Williams, M.S., Collins, P.W., Kitchen, S., Dolan, G., & Mumford, A.D. (2004) *The Coagulation Disorders-Review with Guidelines for Management from the United Kingdom Haemophilia Centre Doctors' Organization*. *Haemophilia*, 10, 593-628. DOI: 10.1111/j.1365-2516.2004.00944.x.

Doll, D.C., Khozouz, R.F., & Triplett, W. M. (2013) *Hematology Case Review*. Philadelphia, PA: Lippincott Williams & Wilkins. ISBN/ISSN: 9781451191431

Gulati, G. L., Filicko-O'Hara, J. & Krause, J.R. (2012) *Case Studies in Hematology and Coagulation*. Chicago, IL: ASCP Press. ISBN-10: 089189585X

Moss, P. & Hoffbrand, V. (2011) *Essential Haematology* .6th Ed. Oxford: Wiley Blackwell. ISBN-13: 978-1405198905

Rodak, B. F. (2011) *Hematology: Clinical Principles and Applications*. 4th Ed. Philadelphia, PA: W. B. Saunders Co. ISBN 13: 978143770625

Rodak, B.F. & Carr, J. H. (2012) *Clinical Hematology Atlas*. 4th Ed. Philadelphia, Pennsylvania: Elsevier Science. ISBN 9781455708307

Immunohematology, Blood Transfusion Science

Archive of Blood Transfusion Articles. [Online] Available from:
<http://www.ncbi.nlm.nih.gov/pmc/journals/669/>. [Accessed: 3rd July 2014].

Blaney, K. D. & Howard, P.R. (2012) *Basic & Applied Concepts of Blood Banking and Transfusion Practices*. Philadelphia, PA: Elsevier. ISBN 9780323086639

Contreras M. (2009) *ABC of Transfusion*. 4th Ed. Hoboken, NJ: Wiley-Blackwell. ISBN-10: 1405156465

Harmening, D. M. (2012) *Modern Blood Banking and Transfusion Practices*. 6th Ed. Philadelphia, PA: FA Davis Company.

Journal of Blood Transfusion. [Online] Available from:
<http://www.hindawi.com/journals/jbt/>. [Accessed: 3rd July 2014].

Lozano, M. Contreras, M. I, &Blajchman, M.A. (2006) *Global Perspectives in Transfusion Medicine*. American Association of Blood Banks. ISBN-13: 978-1-56395-233-3

Rudman, S. V. (2005) *Blood Banking and Transfusion Medicine*. 2nd Ed. Philadelphia, PA: Elsevier Saunders. ISBN 9780721603841

World Health Organization. (2014) *10 Facts on Blood Transfusion*. [Online] Available from:http://www.who.int/features/factfiles/blood_transfusion/en/. [Accessed 3rd July 2014].

Parasitology, Entomology, Clinical Parasitology and Entomology

Anamo, Z &Baraki, N. (2008) *Medical Entomology*. [Online] Available from:
http://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_students/MedicalEntomology.pdf. [Accessed: 3rd July 2014].

Bogitsh, B., Carter, C., & Oeltmann, T. (2012) *Human Parasitology*. 4th Ed. Philadelphia, PA: Elsevier. ISBN 9780124159150

CDC. (n.d.) *Laboratory Identification of Parasitic Diseases of Public Health Concern*. [Online] Available from: <http://www.dpd.cdc.gov/dpdx/>. [Accessed: 9th July 2014].

Engelkirk, P.G. and Duben-Engelkirk, J.L. (2008) *Laboratory Diagnosis of Infectious Diseases: Essentials of Diagnostic Microbiology*. Baltimore, MD: Lippincott Williams & Wilkins. ISBN 13 9780781797016

Gullan, P.J. and Crnaston, P.S. (2010) *The Insects: An Outline of Entomology*. 4th Ed. Hoboken, New Jersey: Wiley-Blackwell

John, D.T. and Petri, W.A. (2006) *Markell and Voge's Medical Parasitology*. 9th Ed. St. Louis, MO: Saunders Elsevier. ISBN 9780721647937

Larone D.H. (2002) *Medically Important Fungi: A Guide to Identification*. Herndon, VA: ASM Press.

Prasad, K.J. (2010, March) *Emerging and Re-emerging Parasitic Diseases*. [Online] Available from: <http://medind.nic.in/jav/t10/i1/javt10i1p45.pdf>. [Accessed: 3rd July 2014].

Service, M.W. (2012) *Medical Entomology for Students*. 5th Ed. Cambridge, Massachusetts: Cambridge University Press. ISBN 9781107668188

Zeibig, E. (2010) *Clinical Parasitology: A Practical Approach*. 2nd Ed. Philadelphia, Pennsylvania: Saunders. ISBN 9781416060444

Carter Jane, Lema Orgenes (2016). *Practical Laboratory Manual for Health Centres in Eastern Africa*. Amref Health Africa. Second Edition.

Appendix 4: Continuous Monitoring and Improvement System

Medical Laboratory Categories at Certificate, Diploma and Higher Diploma levels

Introduction

The Medical Laboratory Sciences Programme continuous improvement monitoring system is a comprehensive system that provides a reporting feedback process for the three levels of the training system (i.e. the placement level, the institutional level and the Health Personnel Council level). It should be seen as a supportive process to facilitate clear and open communication throughout the system. The purpose is to have all parts of the system work together in a linked and coordinated way in order to make programme improvements at all levels.

Each level of the system has specific data collection, analysis, and reporting tasks. Quality leadership is necessary to develop and implement periodic improvement plans that target priority problems. For instance, the clinical placements have the responsibility for improving the teaching and learning in their placements, the institutions have the responsibility for identifying problems common throughout the placements and for designing improvement at the institutional level and the Health Personnel Council has the responsibility for identifying problems common to all institutions and for designing improvements at the national level.

The data collection and reporting instruments are the same for every placement and institution. This allows for comprehensive analysis and good decision making at each level.

The following target programme objectives have been selected to initially achieve the required goals during implementation of the curriculum:

1. Students are achieving mastery skills in the essential learning list
2. Trainers are involved in teaching using available resources
3. Students are involved in an active learning programme
4. The trainers are supported to improve teaching
5. Improvement plans are being implemented
6. Continuous monitoring reports are being submitted to the Health Personnel Council of South Sudan after every 6 months.

Graphic Summary of Continuous Monitoring

1. Indicate what happens at each of the following levels:

- Placement
- Institution
- Health Personnel Council of South Sudan

Health Personnel Council – Level

- a. Teaching/learning materials development and review
- b. Continuous review of the curriculum
- c. Development, monitoring and evaluation of policies and standards pertaining to medical laboratory education, practice and professional conduct
- d. Advising on enforcements of legal aspects pertaining to the medical laboratory profession (e.g. provision of Medical Laboratory Technologists'/Technicians' Act)
- e. Register/Enroll/License Medical Laboratory Technologists and Technicians

2. Institutional- Level

- a. Participate in review and implementation of curricula
- b. Translate and implement Health Personnel Council policies
- c. Participate in development and use of teaching and learning tools
- d. Participate in development of monitoring and evaluation tools
- e. Maintain quality teaching/learning by continuous monitoring and improvement both for classroom and clinical placement
- f. Formation of monitoring and quality improvement committees
- g. Giving regular feedback to the Health Personnel Council
- h. Ensuring professionalism/ethical behavior of students through:
 - a. Good role models
 - b. Conducive teaching/learning environment
 - c. Guidance and counseling
- i. Ensuring linkages between school and clinical placements

3. Placement level: (both classroom and clinical area)

- a. Active participation by student and trainer in teaching/learning process.
- b. Ensure effective supervision of student's learning through preceptorship/mentorship
- c. Ensure availability and use of teaching/learning resources
- d. Ensure provision and maintenance of quality patient/client care
- e. Ensure availability and use of student evaluation tools as per the curricula
- f. Ensure continuous monitoring teaching/learning process and feedback to student and management
- g. Students take initiative and are accountable and responsible for their own learning
- h. Tutors take leadership role in teaching/learning in the placements

Instructions:

- i. This report should be compiled by the Head of Training institution in conjunction with tutors every semester within six months and submitted to the Health Personnel Council.
- ii. Please attach semester examination results (i.e. scores for each student). Give a copy of Semester Examinations.

Name of Training institution.....

Date report was compiled:

Class Room/Theory

1. Organisation of Semester 1 Content

Comment on:

- i. Relevance:**
 - 1) Level of training:
 - 2) Next placement:
 - 3) Needs of the community:
- ii. Sequencing**
 - 1) From simple to complex
 - 2) Known to unknown
- iii. Adequacy:**
 - 1) In terms of time
 - 2) In relation to next placement
- iv. Problems encountered in presentation**

2. Examination:

- a) Percentage of students who scored above 50%

.....
.....
.....

b) From students—(class tutor to write a summary of students' evaluation of the Semester).....

.....
.....

c) Were the students' scores submitted to the Health Personnel Council together with the Term examination results? Yes..... No.....

If No, give reasons

.....
.....

3. Are the students being guided? Yes/No

If Yes/by whom?

.....
.....
.....

If No, give reasons

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.....
.....

4. Are students involved in an active learning programme? Yes/No

If No, give

reasons.....

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.....
.....

Students' comments

.....
.....
.....

Trainers' comments

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.....

5. Have the trainers (clinical staff and tutors) been oriented to the training programme? Yes/No

If Yes, what percentage?

If No, give

reasons.....

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.....
.....

6. Are trainers involved in teaching using available resources?

YesNo.....

If No, give

reasons.....

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7. General comments/suggestions

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.....
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From Tutors/Clinical

Instructors:.....

.....

.....

From

students:.....

.....

Instruction:

- i. This section should be completed by Medical Laboratory Technologist in charge in conjunction with the Head of Training institution.
- ii. Placement meetings should have the following members.
 - a. Placement in charge
 - b. Student representation
 - c. Tutor attached to the placement
- iii. Training institution and hospital joint meeting should have the Medical Laboratory Technologist/Technician and placement in charge, Head of Training institution and 3 tutors, one from each discipline.

1. Are placement meetings to discuss continuous improvement being held monthly? Yes/No

If No, give

reasons.....
.....

2. Are Training institution meetings being held monthly?

If No, give

reasons.....
.....

3. Does the Training institution and hospital hold joint meetings every three months? Yes/No

If No, give

reasons.....
.....

Continuing Education

a) Does the institution have a continuing education programme?

Yes.....No.....

If No, what arrangements are being made to initiate this?

.....
.....
Instructions

- i. This section to be completed by Medical Laboratory Technologist in charge in conjunction with Clinical Supervisors.
- ii. Assessment for Quality Laboratory Practice

1. Which of the following methods does your institution use to assess quality of Laboratory practice?

- a) Use of questionnaire administered to: Medical staff, Student, Laboratory Technologists/Technician, Patients/clients, Opinion leaders in communities
- b) Review of patients'/clients' records
- c) Research
- d) Any other (specify)

2. Which of the following indicates improved laboratory practice in your institution (tick the appropriate response)

- a) Cleanliness of laboratory environment.
- b) Availability of required resources e.g. laboratory equipment/apparatus/instruments, reagents, stains, and supplies
- c) Infection control procedures are in place
- d) Laboratory practice is being carried out according to standard operating procedures
- e) Laboratory practice plans are done and implemented
- f) The workers have positive attitude towards patients

General Comments

To include:

a) Strengths:

Microbiology.....
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.....

Chemistry.....

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Haematology.....

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Histopathology and Cytopathology.....

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Blood Transfusion Science.....

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Medical Parasitology and Entomology.....

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Virology.....

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Immunology.....

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b) Weaknesses

Microbiology.....

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Chemistry.....

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Haematology.....

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.....

Histopathology and Cytopathology.....

.....

Blood Transfusion Sciences.....

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Medical

Parasitology.....

.....

Virology.....

.....

Immunology.....

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Names and signatures of reporting officers:

Name:

Signature:

Name:

Signature:

Appendix 5: Contributors to the curriculum review process

S/No.	Participant	Institution	Position
1.	Charles Abbe	Juba Health Sciences Training School	Principal
2.	Stephen Friday	Juba Health Sciences Training School	Tutor
3.	Lou Louis	Kajo-Keji Training School	Principal
4.	Alwong Rose	Kajo-Keji Training School	Tutor
5.	Moses Wori	Rumbek Training School	Principal
6.	Tiondi Fred	Rumbek Training School	Tutor
7.	Kuol Ajok	Yei Training School	Principal
8.	Angelo Guop	Yei Training School	Tutor
9.	Moi Alex	Nimule hospital	Laboratory
10.	Michael Lasuba	National Public Health Laboratory	Director, Clinical Laboratory Services
11.	Hakim Idris	National Public Health Laboratory	Manager, HIV reference Laboratory
12.	Gregory Wani	National Public Health Laboratory	Director, Public Health Laboratory
13.	Gilbert Abe	National Public Health Laboratory	Acting Director, Quality Assurance
14.	Anthony Wori	National TB Program	
15.	Charles Mazinda	Juba teaching hospital	Laboratory manager
16.	Habib Dada	Trainer	Laboratory specialist
17.	Julu Louis	WHO	IDSR unit
18.	Pita Jane	WHO	Laboratory focal point
19.	Sheila Baya	IDSR-MoH	Public health officer
20.	John Juma	IDSR-MoH	Laboratory specialist

21.	Francis Oromo	University of Juba	Lecturer, School of Medicine
22.	Kuol Arop	Training and professional development	Director, Curriculum development
23.	Samuel Maketh	Training and professional development	Director, Training
24.	Gabriel Daniel	Training and professional development	Director General
25.	Victoria Abua	Training and professional development	Deputy Director, Training
26.	James Lotto	Juba nursing & midwifery school	Principal
27.	Dennis Lodiongo	National Public Health Laboratory	Laboratory Technologist
28.	Tsegaye Asres	Amref Health Africa	Project Manager, Capacity building and training
29.	Jane Carter	Amref Health Africa	Technical Director, Clinical and Diagnostics
30.	Eric Wakaria	Amref Health Africa	Laboratory System Strengthening Specialist
31.	Teferi Mekonen	ASLM	Senior Programme Specialist
32.	Ellen HopeKearns	ASLM	Consultant
33.	Bryan Nyary	ASLM	Consultant
34.	Joel Katoro	CDC	Laboratory advisor