**بسم الله الرحمن الرحيم**

**كلية نبتة**

**NAPATA COLLEGE**

**PROPOSAL FOR THE MEDICAL LABROTARY SCINCES CURRICULUM**

**The college runs a B. Sc. (Honors) degree in 8 semesters of 15 weeks each, and additional 3 weeks/semester are used for assessment.**

***Introduction:***

**عن نبتة :**

تشير الدراسات الاثرية والتاريخية الى ان أرض السودان القديم أستقرت عليها مجتمعات بشرية منظمة

ومتمدنه لاكثر من عشرة آلاف عام. ولقد ظهرت فيها ممالك شكلت فيها مملكة نبته اعظم الحضارات

الافريقية جنوب الصحراء، وقد كانت بدأت بالازدهارفي اوسط القرن الحادي عشر الميلادي واستمرت لألف

عام بعد ذلك

وبتميز نظامها الاقتصادي والسياسي تمكنت مملكة نبته من الانتشار وتوسيع حدودها على جوانب اسفل

واعالي مصر حتى منطقة الاناضول جنوب تركيا )أنظر الخارطه( حيث هزم جيش نبته الاشوريين وحرر

اورشليم المعروفة حاليأً بالقدس. وفي الإنجيل يشار الى طهارقا الملك النبتي الثالث بمحرر وحامي المدينة

المقدسة

وبسيطرتها التامة على البحر الاحمر لعبت نبته دوراً هاماً في التجارة الدولية بربط الشرق الاقصى بموانيء

مصر ومن ثم التفاعل مع جنوب اوروبا عبر البحر الابيض المتوسط.

وبثروتها الزراعية والمعدنية )الذهب والحديد( وضعت حضارة نبته تاثيراً حضارياً هاماً بما عرف لاحقاً

باللغة المرويه والتي ازاحت الحروف الهيروغليفية واحلت محلها حروفأ هجائية مبسطة تضمنت احرف علة

وهي ماكانت تفتقده الهيروغليفية.

اكثر فترات حضارة نبته ازدهاراً تمثلت في علم المصريات تحت عنوان السلالة ال 52 وخاصة خلال حكم تهارقا (690 - 664 قبل الميلاد) والذي شهدت فترة حكمه بناء اهرامات ومستوطنات ومعابد بشمال السودان

وجنوب مصر ماتزال آثارها ماثلة حتى يومنا هذا



وبالطبع لم يكن ممكناً أن تحقق نبتة ذلك الإنتشار دون مبادئ ورؤية ملهمة ولقد كدت الشواهد الاثرية تسامي

القيم الروحية الملهمه التي يتمتع بها نظام الحكم والادارة لتلك المملكه وعلي سبيل المثال فأننا نجد حتي الآن

منحوتاً علي مسلة خاليوت بن بعانخي في معبد البركل تلك الوصايا الدالة علي النضج الأخلاقي و الإداري

والسياسي والسمو الروحي.

ولقد كان إختيارنا إسم نبتة لهذه الكلية تيمناً بهذا التواصل الحضاري المتمدن الذي تبلور فيما بعد بموروث روحي من الديانات السماوية كان ختام مسكها رسالة الإسلام الخالدة، حيث نزل القرآن الكريم مصدقاً لما بين يديه من الكتب السماوية ومهيمناً عليها علي سيدنا محمد صلى الله عليه وسلم ليتمم مكارم الأخلاق ويعلم الناس الكتاب والحكمة ويعلّمهم ما لم يكونوا يعلمون

**NAPATA College**

This new university college is not so much meant to be another higher education institution as it is meant to contribute more substantially to the promotion, modernization and advancement of higher education values.

Our strategy is to modernize the curriculum content and curriculum structures in a way that would highlight the uniqueness of our institution.

**Mission:**

Our college will work as a delivery system whose capacity building and research outputs will correspond to the society needs and whose teaching programmes will be sufficiently dynamic to respond to the ever changing conditions of the labour market. The university college as such can act as a model of modernization in its academic fields.

**Vision:**

Through an implementation of robust quality assurance regime Napata College hopes to obtain in five years quality certificates from ISO and other regional and international accreditation institutions.

Following inception of its programs Napata would hope to obtain within ten years to become a model of quality for Sudanese higher education institutions, regarding its capabilities to satisfy the needs of the Sudanese civil service and the society at large and the needs of the services and industrial labour markets.

**Goals and objectives:**

To provide modernized, relevant and transformable academic programs which satisfy the needs of our local, national and global communities.

To reach international levels in standards while maintaining local values and culture.

To Create an advanced educational and research environment for our students and researchers.

ICT techniques shall be heavily utilized in teaching and evaluation with regular evaluation processes that procures continuous promotion of academic dynamics.

To promote teaching facilities to the latest technical standards (libraries, laboratories…etc).

To introduce the application of standard aptitude and IQ tests like those adopted by all American universities

To integrate the academic programmers with psychological counseling programmers thus emphasizing the characteristics of our university college as a truly modernized academic institution.

To recruit the best professors available in the labour market particularly from retired and repatriated Sudanese professors.

Help establish and finance technology incubators to avail jobs for talented students to run their own entrepreneur companies before launching their enterprises in the broad technology investment market.

To build an educational/cultural bridge with equivalent regional and international institutions.

The Napata college administration shall conduct continuous evaluation for all components of the teaching-learning process including evaluation of the academic programs, the teachers and students performance.

Students shall be asked to fill in staff evaluation questionnaires (that are both valid and reliable) for every course in each semester.

* **أسماء اللجنة التي قامت بإعداد المنهج:**

1. بروفيسير مبارك الكرسني أستاذ - أمراض دم.
2. د. محمد عبدالقادر مهدي أستاذ مساعد - كيمياء سريرية.
3. د. مها محجوب عثمان أستاذ مساعد - طفيليات وحشرات طبية.
4. د. سارة محمد علي أستاذ مساعد - أحياء دقيقة.
5. د. الصادق قسوم أستاذ مساعد - أنسجة مريضة.
6. د. زاهر حلمي أستاذ مشارك – الاحياء الجزيئية والفايروسات
7. د. تهاني سيد عشميق أستاذ مساعد – المناعة السريرية

* **الدرجة العلمية المقترحة التي ستمنح لدارسي هذا البرنامج هي بكالوريوس الشرف في علوم المختبرات الطبية في أحد التخصصات الاتية:**

1. الكيمياء السريرية Chemical Pathology
2. الاحياء الدقيقة Microbiology
3. أمراض الدم والمناعة الدموية Hematology and Immunhematology
4. الأنسجة المريضة وعلم الخلايا Histopathology and Cytology
5. الطفيليات والحشرات الطبية Parasitology and Medical Entomology

1. ***Objectives***

**1.1 General objective**

To qualify critical mass of medical laboratory staff to work in universities, research centers and to render high standard services in public and private hospitals.

**1.2 Specific objectives**

1. To involve the students in an intellectually stimulating and satisfying experience of learning, studying and research.
2. To provide students with foundation of medical laboratory knowledge and practice skills; performing effectively in clinical diagnostic services, academics and quality assurance: and function independently or in collaboration with other members of the health team in the care of individuals and groups at all levels of health care.
3. To develop in students, the ability to apply their medical laboratory knowledge and skills to the solution of theoretical and practical problems in laboratory medicine.
4. To develop students through an education in medical laboratory sciences, a range of transferable skills of value in medical and non-medical employment.
5. To provide students with a knowledge and skills base from which they can proceed to further studies in specialized areas involving medical sciences.
6. To generate in students, an appreciation of the importance of medical laboratory sciences in an economic, health and social context.
7. To produce students with the ability to generate biological and diagnostic reagents as well as to fabricate and maintain laboratory equipment.
8. To empower undergraduates with medical laboratory sciences with skills that will enable them to engage in income yielding ventures.
9. ***Main features of curriculum:***

The curriculum follows the 'semester system' extending over 4 years: full eight semesters.

* The first two semesters form the common preparatory year.
* The third semester, the fourth, fifth and sixth semesters are common to all departments of the program.
* The seventh to eighth semesters constitute mainly the specialization stage in MLS, training skills in Hospitals & community.

## *- Expected Student Learning Outcomes:*

Upon graduation from the program, students will be able to demonstrate:

1. Competency to perform a full range of testing in the contemporary medical laboratory encompassing pre-analytical, analytical, and post-analytical components of laboratory services, including Hematology, Chemical pathology, Microbiology, Histopathology and medical Parasitology.
2. Proficiency to problem-solves, troubleshoot, and interpret results, and use statistical approaches when evaluating data.
3. Professional conduct, respecting the feelings and needs of others, protecting the confidence of patient information, and not allowing personal concerns and biases to interfere with the welfare of patients.
4. Administrative skills consistent with philosophies of quality assurance, continuous quality improvement, laboratory education, fiscal resource management, and appropriate composure under stressful conditions.
5. Application of safety and governmental regulations and standards as applied to medical laboratory practice.
6. Effective communication skill to ensure accurate and appropriate information transfer.
7. Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Chemical pathology, Microbiology Histopathology and medical Parasitology.
8. Demonstrate technical skills, social behavior, and professional awareness incumbent upon a laboratory technician.
9. Apply systematized problem solving techniques to identify and correct procedural errors, identify instrument malfunctions and seek proper supervisory assistance, and verify the accuracy of laboratory results obtained.
10. Operate and maintain laboratory equipment, utilizing appropriate quality control and safety procedures.
11. ***Educational methods:***

- Lectures, tutorials, presentations, seminars, assignments and practical sessions.

5 ***Scores and Grades:***

* Grading scale: The five-point grading scale according to the following table is applied:

|  |  |  |
| --- | --- | --- |
| Score Range | Letter Grade | Interpretation |
| 80 and more | A | Excellent |
| 70-79.99 | B | Very Good |
| 60-69.99 | C | Good |
| 50-59.99 | D/ D\* | Pass/Pass after supplementary exam. |
| Less than 50 | F | Fail |

***6Study program:***

**Semester 1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-CHM-111 | General Chemistry  الكيمياء العامة | 3(2+1) | 2/2 |
| MLS-PHS-112 | Medical Physics  الفيزياء الطبية | 3(2+1) | 2/2 |
| MLS-ENG-113 | English Language 1  اللغة الانجليزية 1 | 3(3+0) | 3/0 |
| MLS-PHO-114 | Physiology  وظائف الأعضاء | 2(2+0) | 2/0 |
| MLS-ISL-115 | Islamic Culture1  ثقافة اسلامية | 2(2+0) | 2/0 |
| MLS-ARB-116 | Arabic Language 1  اللغة العربية 1 | 3(3+0) | 3/0 |
| MLS-ANA-117 | Anatomy  التشريح | 2(2+0) | 2/0 |
| MLS- COM -118 | Computer Sciences 1  علوم الحاسوب 1 | 3(2+1) | 2/2 |
| MLS-MAT-119 | Laboratory Mathematic  رياضيات المعامل | 2(2+0) | 2/0 |
| **Total** |  | **23** | **20/6** |

**Semester 2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-BIO-121 | Biochemistry  الكيمياء الحيوية | 3(2+1) | 2/2 |
| MLS-PHO-122 | Physiology  وظائف الأعضاء | 2(2+0) | 2/0 |
| MLS-COM-123 | Computer Sciences 2  علوم الحاسوب 2 | 3(2+1) | 2/2 |
| MLS-HIST-124 | Histology  علم الأنسجة | 3(2+1) | 2/2 |
| MLS-ENG-125 | English Language 2  اللغة الانجليزية 2 | 3(3+0) | 3/0 |
| MLS-BIO-126 | Cell Biology and Genetics  احياء الخلية والجينات | 3(2+1) | 2/2 |
| MLS-ARB-127 | Arabic Language 2  اللغة العربية 2 | 2(2+0) | 2/0 |
| MLS-SUD-128 | Sudanese Studies  دراسات سودانية | 2(2+0) | 2/0 |
| MLS-SAF-129 | Lab Safety  سلامة المعامل | 2(2+0) | 2/0 |
| **TOLAT** |  | **23** | **19/8** |

**Semester 3**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-PTH-231 | General Pathology  علم الامراض العام | 2(2+0) | 2/0 |
| MLS-IMM-232 | Basic Immunology  اساسيات علم المناعة | 3(2+1) | 2/2 |
| MLS-CHE-233 | Chemical Pathology 1  الكيمياء السريرية 1 | 3(2+1) | 2/2 |
| MLS-HEM-234 | Basic Hematology  اساسيات علم الدم | 3(2+1) | 2/2 |
| MLS-MIC-235 | Basic microbiology  اساسيات علم الاحياء الدقيقة | 3(2+1) | 2/2 |
| MLS-HIS-236 | Basic Histopathology 1  اساسيات علم الانسجة المريضة 1 | 3(2+1) | 2/2 |
| MLS-PRO-237 | Protozology1  علم الاوالي | 3(2+1) | 2/2 |
| MLS-ENG-238 | English Language 3  اللغة الانجليزية 3 | 2(2+0) | 2/0 |
| **TOLAT** |  | **22** | **16/12** |

**Semester 4**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-MOL-241 | Basic Molecular Biology  اساسيات علم الاحياء الجزيئية | 3(2+1) | 2/2 |
| MLS-CHE-242 | Chemical Pathology 2  الكيمياء السريرية 2 | 3(2+1) | 2/2 |
| MLS-SER-243 | Serology and immunohematology  علم مناعة الدم والمصل | 3(2+1) | 2/2 |
| MLS-BAC-244 | Basic Bacteriology 1  اساسيات علم الجراثيم 1 | 3(2+1) | 2/2 |
| MLS-HIS-245 | Basic Histopathology 2  اساسيات علم الانسجة المريضة 2 | 3(2+1) | 2/2 |
| MLS- ENT-246 | Medical Entomology  علم الحشرات الطبية | 3(2+1) | 2/2 |
| MLS-ENG-247 | English Language 4  اللغة الانجليزية 4 | 3(3+0) | 3/0 |
| **TOLAT** |  | **21** | **15/12** |

**Semester 5**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-CHE-351 | Chemical Pathology 3  الكيمياء السريرية 3 | 3(2+1) | 2/2 |
| MLS-BC-352 | Blood Cells Disorders  اختلال خلايا الدم | 3(2+1) | 2/2 |
| MLS-BAC-353 | Basic Bacteriology 2  اساسيات علم الجراثيم 2 | 3(2+1) | 2/2 |
| MLS-HIS -354 | Histopathological and Cytological Techniques 1  تقنيات الانسجة المريضة والخلايا 1 | 3(2+1) | 2/2 |
| MLS-CES-355 | Helminthology1 (Cestodes and Trematodes)  علم الديدان 1 (الديدان الشريطية والورقية) | 3(2+1) | 2/2 |
| MLS-MOLB-356 | Advanced Moleclar Biology  علم الاحياء الجزيئية المتقدم | 3(2+1) | 2/2 |
| MLS -HINF0-357 | Health Information System | 2(2+0) | 2/0 |
| **TOLAT** |  | **20** | **14/12** |

**Semester 6**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-CHE-361 | Chemical Pathology 4  الكيمياء السريرية 4 | 3(2+1) | 2/2 |
| MLS-HEM-362 | Immunohematology and Bleeding Disorders  اختلال مناعة الدم والنزف | 3(2+1) | 2/2 |
| MLS-MIC-363 | Advanced Microbiology  علم الاحياء الدقيقة المتقدم | 3(2+1) | 2/2 |
| MLS-HIS-364 | Histopathological and Cytological Techniques 2  تقنيات الانسجة المريضة والخلايا 2 | 3(2+1) | 2/2 |
| MLS-NEM-365 | Helminthology2 ( Nematodes)  علم الديدان2 (الديدان الاسطوانية) | 3(2+1) | 2/2 |
| MLS-IMMU-366 | Clinical immunology  علم المناعة السريرية | 3(2+1) | 2/2 |
| MLS-SER-367 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| **TOLAT** |  | **21** | **12/18** |

**Semester 7**

**Specializations**

1. **Chemical Pathology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-471 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-STA-472 | Biostatistics  الاحصاء الحيوي | 3(2+1) | 2/2 |
| MLS-RES-473 | Research Methods  طرق البحث | 2(2+0) | 2/0 |
| MLS-QC-474 | Quality Control in Chemical Pathology  ضبط الجودة في الكيمياء السريرية | 3(2+1) | 2/2 |
| MLS-INS-475 | Instrumentations in Chemical Pathology  الأجهزة في مختبر الكيمياء السريرية | 3(2+1) | 2/2 |
| MLS-MD-476 | Metabolic Diseases and Body Fluids  التغيرات الحيوية و الكيميائية في أمراض الأستقلاب وسوائل الجسم | 3(2+1) | 2/2 |
| MLS-PRJ-477 | Research Project 1 | 3 | 3/0 |
| **TOLAT** |  | **20** | **13/14** |

1. **Hematologyand Immunohematology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-471 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-STA-472 | Biostatistics  الاحصاء الحيوي | 3(2+1) | 2/2 |
| MLS-RES-473 | Research Methods  طرق البحث | 2(2+0) | 2/0 |
| MLS-ANE-474 | Anemia’s and Hemoglobin Disorders  فقر الدم | 3(2+1) | 2/2 |
| MLS-LEU-475 | Leukemia’s and Lymphomas  سرطان الدم والغدد الليمفاوية | 3(2+1) | 2/2 |
| MLS-HOM-476 | Bleeding and thrombotic Disorders  اختلال النزف والتجلط | 3(2+1) | 2/2 |
| MLS-PRJ-477 | Research Project | 3 | 3/0 |
| **TOLAT** |  | **20** | **13/14** |

1. **Microbiology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-471 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-STA-472 | Biostatistics  الاحصاء الحيوي | 3(2+1) | 2/2 |
| MLS-RES-473 | Research Methods  طرق البحث | 2(2+0) | 2/0 |
| MLS-BAC-474 | Medical Bacteriology  علم الجراثيم الطبي | 4(2+2) | 2/4 |
| MLS-IMM-475 | Immunological Techniques  تقنيات المناعة | 3(2+1) | 2/2 |
| MLS-VIR-476 | Virology  علم الفيروسات | 3(2+1) | 2/2 |
| MLS-PRJ-477 | Research Project 1 | 3 | 3/0 |
| **TOLAT** |  | **21** | **13/16** |

1. **Histopathology and Cytology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-471 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-STA-472 | Biostatistics  الاحصاء الحيوي | 3(2+1) | 2/2 |
| MLS-RES-473 | Research Methods  طرق البحث | 2(2+0) | 2/0 |
| MLS-HIS-474 | Advanced Histopathological Techniques1  تقنيات علم الانسجة المتقدم 1 | 3(2+1) | 2/2 |
| MLS-GYN-475 | Gynecological Cytology  علم الخلايا في الاناث | 3(2+1) | 2/2 |
| MLS-CYT-476 | Cytogenetic & Molecular Techniques  تقنيات علم الوراثة الخلوية والاحياء الجزيئية | 3(2+1) | 2/2 |
| MLS-PRJ-477 | Research Project 1 | 3 | 3/0 |
| **TOLAT** |  | **20** | **13/14** |

1. **Parasitology and Medical Entomology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-471 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-STA-472 | Biostatistics  الاحصاء الحيوي | 3(2+1) | 2/2 |
| MLS-RES-473 | Research Methods  طرق البحث | 2(2+0) | 2/0 |
| MLS-TPAR-474 | Tropical Parasitology  علم طفيليات المناطق الحارة | 3(2+1) | 2/2 |
| MLS-AENT-475 | Advanced Medical Entomology  علم الحشرات الطبية المتقدم | 3(2+1) | 2/2 |
| MLS-PARA-476 | Diagnostic Parasitological Techniques التقنيات التشخيصية الطفيلية | 3(2+1) | 2/2 |
| MLS-PRJ-477 | Research Project 1 | 3 | 3/0 |
| **TOLAT** |  | **20** | **13/14** |

**Semester 8**

**Specializations**

1. **Chemical pathology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-481 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-MNG-482 | Laboratory Management and Quality Assurance  ادارة المعامل وتوكيد الجودة | 2(2+0) | 2/0 |
| MLS-ETH-483 | Medical Ethics and Professionalism  الأخلاقيات الطبية والمهنية | 2(2+0) | 2/0 |
| MLS-GIT-484 | Biochemical Changes in Renal and Gastrointestinal Tract Diseases  التغيرات الحيوية و الكيميائية في أمراض الكلي والجهازالهضمي | 4(2+2) | 2/4 |
| MLS-ENZ-485 | Enzymology and Endocrinology  علم الانزيمات والغدد الصماء | 3(2+1) | 2/2 |
| MLS-ACHM-486 | Advanced Chemical Pathology  علم الكيمياء السريرية المتقدم | 4(2+2) | 2/4 |
| MLS-PRJ-487 | Research Project 2 | 3 | 3/0 |
| **TOLAT** |  | **21** | **13/16** |

1. **Hematology and Immunohematology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-481 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-MNG-482 | Laboratory Management and Quality Assurance  ادارة المعامل وتوكيد الجودة | 2(2+0) | 2/0 |
| MLS-ETH-483 | Medical Ethics and Professionalism  الأخلاقيات الطبية والمهنية | 2(2+0) | 2/0 |
| MLS-IMMH-484 | Immunohematology and Blood Bank  مناعة الدم وبنك الدم | 4(2+2) | 2/4 |
| MLS-QAH-485 | Quality Assurance in Hematology  توكيد الجودة في علم الدم | 3(2+1) | 2/2 |
| MLS-AHEM-486 | Advanced Techniques in Hematology  التقنيات المتقدمة في علم الدم | 4(2+2) | 2/4 |
| MLS-PRJ-487 | Research Project 2 | 3 | 3/0 |
| **TOLAT** |  | **21** | **13/16** |

1. **Microbiology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-481 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-MNG-482 | Laboratory Management and Quality Assurance  ادارة المعامل وتوكيد الجودة | 2(2+0) | 2/0 |
| MLS-ETH-483 | Medical Ethics and Professionalism  الأخلاقيات الطبية والمهنية | 2(2+0) | 2/0 |
| MLS-BAC-484 | Bacteriological Techniques  تقنيات علم الجراثيم | 4(2+2) | 2/4 |
| MLS-MYC-485 | Mycology  علم الفطريات | 3(2+1) | 2/2 |
| MLS-INF-486 | Infection Control  مكافحة العدوى | 3(2+1) | 2/2 |
| MLS-PRJ-487 | Research Project 2 | 3 | 3/0 |
| **TOLAT** |  | **20** | **13/14** |

1. **Histopathology and Cytology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-481 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-MNG-482 | Laboratory Management and Quality Assurance  ادارة المعامل وتوكيد الجودة | 2(2+0) | 2/0 |
| MLS-ETH-483 | Medical Ethics and Professionalism  الأخلاقيات الطبية والمهنية | 2(2+0) | 2/0 |
| MLS-NGYN-484 | non gyenacological Cytology  علم الخلايا في أمراض  غير الاناث | 4 (2+2) | 2/4 |
| MLS-AHIS-485 | Advanced Histopathological Techniques2  تقنيات علم الانسجة المتقدم 2 | 4(2+2) | 2/4 |
| MLS-PAT-486 | Systemic Pathology  علم الامراض الجهازية | 3(2+1) | 2/2 |
| MLS-PRJ-487 | Research Project 2 | 3 | 3/0 |
| **TOLAT** |  | **21** | **13/16** |

1. **Parasitology and Medical Entomology specialization:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Course Title** | **CREDIT HOUR** | **Contact**  **Hours/Week** |
| **Theory /lab** |
| MLS-SER-481 | In-service Training  التدريب الحقلي | 3(0+3) | 0/6 |
| MLS-MNG-482 | Laboratory Management and Quality Assurance  ادارة المعامل وتوكيد الجودة | 2(2+0) | 2/0 |
| MLS-ETH-483 | Medical Ethics and Professionalism  الأخلاقيات الطبية والمهنية | 2(2+0) | 2/0 |
| MLS-IPAR-484 | Immune parasitology  مناعة علم الطفيليات | 4(2+2) | 2/4 |
| MLS-EPD-485 | Epidemiology of Parasitic Disease  وبائيات الأمراض الطفيلية | 3(2+1) | 2/2 |
| MLS-DPAR-486 | Diagnostic Techniques in Parasitology  التقنيات التشخيصية في علم الطفيليات | 4(2+2) | 2/4 |
| MLS-PRJ-487 | Research Project 1 | 3 | 3/0 |
| **TOLAT** |  | **21** | **13/16** |

|  |
| --- |
| **Semester One**  **Syllabus** |

**Course title**: General chemistry

**Course symbols and numbers**: MLS-CHM-111

**Duration and credits**: 15weeks (3 CHs)

**Intended Students**: Semester 1

**Prerequisites**: Chemistry

## Outline

(1) Atomic Structure, Structure of atoms, fourth quantum numbers, electron configurations by spdf and boxes, Lewis Structures.

(2) Periodic table, trend of physical and chemical properties across period and group, Chemical bonding, physical and chemical bonds, atomic and molecular orbital’s, hybridization (Sp, sp2 and sp3 ).

(3) Organic compounds, properties, reactions and classification of organic molucules, hydrocarbons and hydrocarbons derivatives.

(4)Aliphatic hydrocarbons,acyclic and cyclic, straight or branched chain, saturated hydrocarbons (alkanes and their derivatives), aliphatic cyclic compounds.

(5)Aromatic hydrocarbons,aromatic cyclic compounds, homocyclic, one ring: eg benzene, toluene, phenol and so on, fused rings: examples, naphthalene, anthracene.

Aromatic cyclic compounds, hetrocyclic compounds examples pyridine, furan, pyrole , thiophene .

(6) H[ydrocarbons](http://en.wikipedia.org/wiki/Hydrocarbon) derivatives (Functional groups), these are contain nomenclature ,reactions, preparation , uses and physical properties of Alcohols, phenols, ethers, thiols, ketones, aldehydes, carboxylic acids, esters, amines, amide, alkyle halides and nitriles.

## Rationale

This course is intended to provide the students with a reasonably detailed account of basic general chemistry and basic organic chemistry. Here the students study the following:

Atomic Structure , Structure of atoms (electrons, protons, neutrons) and isotopes, fourth quantum numbers, principle, secondary, magnetic and spin quantum number, electron configurations by spdf and boxes, Lewis Structures. Learning activities will help them knowledge about periodic table, trend of physical and chemical properties across period and group , Chemical bonding, physical bonds (hydrogen bonding, vander walls force), chemical bonds (ionic, covalent, metallic and coordinate), atomic and molecular orbital’s, hybridization (Sp, sp2 and sp3 ).

This block is particularly planed to facilitate learning about the organic compounds, properties, reactions and classification of organic molucules, hydrocarbons and hydrocarbons derivatives.

**Aliphatic hydrocarbons:**

These shall include two types namely acyclic and cyclic, which in turn include straight or branched chain consisting of saturated hydrocarbons (alkanes and their derivatives) and unsaturated hydrocarbons (alkenes, alkynes, and their derivatives) finally aliphatic cyclic compounds.

**Aromatic hydrocarbons:**

These include the two types: **aromatic cyclic** **compounds** which are called homocyclic (one ring, fused ring) as well as **aromatic cyclic compounds** are called heterocyclic compounds.

**H**[**ydrocarbons**](http://en.wikipedia.org/wiki/Hydrocarbon) **derivatives (Functional groups)**:

These contain definition , Functional group, nomenclature, chemical properties (reactions and preparation) and physical properties of different types of organic compounds ( **Alcohols, phenols, ethers, thiols, ketones, aldehydes, carboxylic acids, esters amines, amide**).

It is planned to achieve these objectives through lectures, quizzes, problem solving and seminars, as well as lab skills to integrate theoretical and practical knowledge.

## General objectives

***By the end of this course the student is expected to***:

* Describe about basic information of atom, sub atom and atomic structure.
* Recognize the fourth quantum numbers and their roles.
* Describe the electronic configurationally and correlate it with quantum numbers.
* Apply the fourth quantum numbers in the electronic configurationally of elements.
* Define the various common types of chemical bonding.
* Explain the various structure of chemical bonding.
* Distinguish between various types of chemical bonding.
* Recognize trend of physical and chemical properties across period and group in periodic table.
* Correlate between Q. N., chemical bonding, electronic configurational and periodic table.
* Define the organic compounds and their classification.
* Classify the organic compounds.
* Differentiate between various common types of functional groups (nomenclature, reaction, preparation, uses)
* Perform, provide name and draw the structural formula for organic molecules.
* Prepare and react all required organic compounds.

Specific objectives

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

**Atomic Structure:**

* Locate structure of atoms (electrons, protons, neutrons) and isotopes.
* Describe the states of atoms losses or gains electrons, cation or anion.

Draw the electron configurations by *spdf* and boxes, and also lewis Structure.

* Locate the position of element in periodic table across the period and group.
* Define the term like, principle, secondary, magnetic and spin quantum number, and their role to determine the size, energy and shape of the orbital.
* Determine and define the chemical bonding (ionic, covalent, metallic and coordinate bond) and distinguish between them.
* Determine and define the physical bonding (hydrogen and vander walls bonding) and distinguish between them.
* Determine and define the chemical bonding (ionic, covalent, metallic bonding) and distinguish between them.
* Describe the atomic and molecular orbitals; explain the hybridization process, especially the hybridization of C-atom, like (Sp, sp2 and sp3 hybridization).

**Organic compounds**

* + Identify the main and common physical properties of organic molecules.
  + Identify classification of organic molecules, hydrocarbons and hydrocarbons derivatives.

**Hydrocarbons compounds**

* Identify the two main classes of organic compounds.
* Describe the acyclic and cyclic compound.
* Define and draw the straight and branched chain hydrocarbons.
* Identify saturated hydrocarbons (alkenes and their derivatives).
* Name alkenes and their derivatives
* Practice prepares and react alkenes and their derivatives.
* Identify unsaturated hydrocarbons (alkenes and alkynes and their derivatives).
* Names alkenes and alkynes and their derivatives.
* Identify aliphatic cyclic compounds.
* Name cyclic alkenes and their derivatives.
* Identify aromatic hydrocarbons.
* Define the homocyclic ring, one ring, benzene, toluene, phenol …. To name some examples.
* Define homocyclic ring, fused rings, naphthalene, anthracene.
* Identify aromatic cyclic compounds including hetrocyclic compounds , pyridine, furan, pyrole , thiophene and their derivatives.

**H**[**ydrocarbons**](http://en.wikipedia.org/wiki/Hydrocarbon) **derivatives (Functional groups)**

* Identify aromatic hydrocarbons derivatives.
* Name alcohols, phenols, ethers, thiols, ketones, aldehydes, carboxylic acids, esters amines, amide by using IUPAC and common system.
* Define and draw the structure of alcohols, phenols, ethers, thiols, ketones, aldehydes, carboxylic acids, esters amines, and amide.
* Identify and practice (problem + solution): preparation and reaction of alcohols, phenols, ethers, thiols, ketones, aldehydes, carboxylic acids, esters amines, and amide.

***Evaluation***

Final exam =60%

Lab =30%

Seminars = 10%

***Recommended reading material:***

1. List Power point files prepared by lecturers
2. List PDF files
3. References:

3-1- Clayden J. et al. - Organic chemistry. (OUP 2000)

3-2- Morrison & Boyd- Organic Chemistry, sixth edition.

# Title of the course: Medical Physics (MLS-PHS-112)

I**ntended semester:**  Semester 1

**Course duration**: 15 weeks

**Lectures**: 2 hours per week- Duration 15 weeks

**Credit hours**: 3 hours per week

**Rationale**

This course is intended for medical laboratory science students

**General objectives**

## By the end of the course ML. students should be able to:-

1. Recognize the principles of mechanics, optics, temperature measurement and basic calorimetric.

2. State the properties of matter and other physical parameters related to medical physics

**Specific objectives**

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

1. Recognize the units and dimensions plus dimensional analysis

2. State the properties of matter, fluid flow, friction, surface tent ion, and oscillatory motion.

3. State the principles of wave phenomena and optics.

4. Recognize the principles of temperatures measurement and calorimetry

5. Explain kinetic theory, bases of elctrostatistics, & introduction to electronics.

1. Describe the ‘gas laws’ and demonstrate their relationship to the understanding of physiological processes.
2. Describe the physical principles of light waves production and propagation, as applied to ophthalmic optics and vision.
3. Describe the physical principles of radiation with particular emphasis on production of x-rays, γ-rays, and interaction of these with material
4. Show understanding of the physical principles of conventional radiography, Computed tomography (CT), ultrasound, and magnetic resonance imaging (MRI), γ- camera and radiation protection.
5. Show understanding of the physical principles of anesthetic machines, physiotherapy and fitness equipments, ECG, EEG, EMG,

**Instructional methods**

1. Lectures
2. Laboratory practical
3. Tutorials

**Evaluation**

Final examinations run by internal examiners and consist of the following:

1. M.C.Q.S:
2. Short questions:

***Recommended reading material:***

|  |
| --- |
| 1. Krane, 2012, *Modern Physics,*John Wiley & Sons |

### [Philip Palin Dendy](http://www.bookdepository.com/author/Philip-Palin-Dendy), 2011, [Physics for Diagnostic Radiology](http://www.bookdepository.com/Physics-for-Diagnostic-Radiology-Philip-Palin-Dendy-Brian-Heaton-John-G-Webster-Slavik-Tabakov-E-Russell-Ritenour-Kwan-Hoong-Ng/9781420083156?ref=grid-view),[Taylor & Francis Inc](http://www.bookdepository.com/publishers/Taylor-Francis-Inc)

1. College notes

**Coursetitle*:*** English Language1, 2, 3 and 4

**Symbol and number:**  MLS-ENG-113

**credits: 14** CHs (semester1,2,3 and 4)

**Responsible multidisciplinary group:** University Requirements Staff

**Rationale**

The sources of health information in the World are still in English. The Internet navigation to obtain information is basically in English. Some of the patients, attending clinics in Sudan, may only speak English language. Passing English language examination is an essential entry requirement to universities in Sudan.

General objectives

By the end of this course, the student is expected to:

1. Pronounce correctly the medical terns, including those related to health services in the country.
2. Read correctly and show understanding of texts from medical books.
3. Expresses himself/herself in good English describing his daily activities, career ambitions, present problems in health.

**Specific objectives**

By the end of this course, the student is expected to:

1. Explain the signs used in dictionaries for correct pronunciation.
2. Pronounce medical terms, including those used in basic medical sciences, clinical sciences, and health services.
3. Explain the prefix and suffix component of words, and word roots used in health and relate them to their original language, and explain the meaning of new words without frequent resort to a dictionary.
4. Read loudly and correctly, at an acceptable speed, paragraphs from medical texts, and show understanding of the material read.
5. Write clearly and correctly, dictated paragraphs from medical texts, and show understanding of the material written.

##### Skim new material from medical textbooks or journals to identify the main topics

##### Search literature in English to find specific information.

##### Write correct notes from extensive articles and prepare charts and diagrams from them.

##### Enumerate the general ideas of any article and distinguish them from specific supporting information.

##### Identify and understand signal words in texts for classification, contrast, chronological order, process and cause and effect.

##### Translate 3 pieces (each 300 words) from English to Arabic, and three others from Arabic to English, both sets from medical literature.

**Recommended textbooks and/or reading material:**

College notes

The Language of Medicine in English- Tiersky + Tiersky, Prentice Hall Regents, ISBN: 0-13-521444-0

**Course title**: Physiology

**Course symbols and numbers**: MLS -PHO- 114 and MLS-PHO-122

**Duration and credits**: 30 weeks (4 CHs)

**Responsible multidisciplinary group:**

A physiologist

**Intended Students**: Semester 1 and 2

**Prerequisites**: nil

***Outline***

Components of the cells, tissues, organs and systems are described and discussed on basic physiology linked to systemic pathology including: the Histological structure of each body system and Basic concept in systemic physiology.

***General objectives***

***By the end of this block the student should be able to:***

1. Identify the normal histological features of different body systems.
2. Explain the basic normal physiological mechanisms in the different body systems(Resp, cardiovascular,muscloskeletal, …etc.).

***Specific objectives***

***By the end of this course the student is expected to***:

* Identify basic histological structure of major body systems.
* Describe the basic concepts of pathophysiology at the cellular level related to injury, the self-defense mechanism, mutation, and cellular proliferation.
* Describe all the system in the body
* Identify the function and complications of dysfunction
* Explain how all function integrated
* Identify the molecular basis of its functions

***Contents***

1. Body fluids.
2. Cell physiology.
3. Blood
4. Introduction to blood.
5. Composition, production, cell type.
6. Blood groups
7. Coagulation, hemostasis, hemorrhage.
8. Cardiovascular system
9. Cardiac muscle
10. Electrocardiogram ECG
11. The cardiac cycle
12. Systemic circulation
13. Pulmonary circulation
14. Coronary circulation
15. Cerebral circulation
16. Respiratory system
17. Ventilation
18. Gas exchange
19. Gastrointestinal physiology
20. Mastication, and saliva, swallowing
21. The stomach
22. The pancreas
23. The liver and biliary system
24. The small intestine (endocrine , absorption , digestion)
25. The colon (secretion, absorption , defecation)
26. The endocrine system
27. The endocrine gland (pituitary, thyroid, adrenal , pancreatic)
28. The hormones (active ,abnormal functions)
29. Applied physiology
30. Urinary system
31. The nephrons
32. Renal circulation
33. Glomerular function
34. Functions (excretion , micturation)
35. The reproductive system
36. Puberty
37. The menstrual cycle
38. Sex hormones
39. Menopause
40. Fertilization
41. Abnormalities of reproductive system

Pregnancy and perinatal physiology central nervous system

1. Early changes
2. the placenta
3. Labour
4. Fetal circulation

Changes at birth

central nervous system

1. Functional anatomy
2. The sensory system
3. Pain

The motor system

The autonomic nervous system

Division, control of visceral function

Week 1: (Problem:Review basic structure & function of Blood CVS,Respiratory&GIT Systems)

Histology, physiology

Week 2: (Problem:)

Pathology

Week 3: (Problem: Certain common systemic diseases pathophysiology& brief on diagnosis & management )

***Seminars***

1. Pathophysiology of Asthma.
2. Pathophysiology of ischemic Heart diseases.

***Evaluation :***

Course work (Mid semester exam+ assignments + seminars) 40%

Final exam 60%

***Recommended text books:***

Shier D, Butler J, Lewis R. Hole's Human Anatomy & Physiology. 12th ed. Boston, MA:

McGraw-

Young, Whether’s Fnctional Histology, 4e, 2000, Churchill Livingstone, ISBN 0443056188 [IE]

Guyton. Human Physiology and Mechanism of Disease, 6e, WB Saunders, ISBN 0808920030 [IE]

**Coursetitle*:*** Islamic studies MLS-ISL-115

**Symbol and number:** ISLAM-111 and 121

**Duration and credits:** Longitudinal 2 CHs

**Prerequisites:** Nil

**الأهداف الخاصة للمنهج 111:**

**أولاً:القرآن الكريم والسنة المطهرة والفكر الاسلامي**

**بنهاية هذا المقرر يتوقع من الطالب ان:**

1. **يشرح سورة النور، مع معاني الكلمات (تكليف- 12 ساعة)**
2. **يشرح علم مصطلح الحديث**
3. **يُبدي فهم اًلمصطلحات أصول الفقه المتعلقة بكيفية استنباط الأحكام الشرعية**
4. **يناقش أفكار الفرق الإسلامية المعاصرة (خمس فرق رئيسة)، واستقامتها أو انحرافاتها.**

**ثانيا: الأحكام الفقهية في المرض والموت**

1. **يشرح أحكام طهارة المريض وعباداته**
2. **يورد النصوص الخاصة بزيارة المريض**
3. **يورد النصوص الآمرة بالتداوي**
4. **يوضح الأحكام الخاصة بحفظ الصحةوالنفس**
5. **يوضح الأحكام الخاصة بمعاملة المريض**

**الأهداف الخاصة للمنهج 121**

**أولاً: القرآن الكريم**

1. **يفسر سورة الحجرات مع معاني الكلمات**
2. **يستنبط سلوكيات المسلم الواردة في السورة**

**ثانياً: الأحكام الفقهية**

1. **يشرح فقه الجنائز، مع التركيز على ما يجب عند الاحتضار، ولحظة الموت، وكيفية غسل الميت، و من يغسل من؟ وكيفية الصلاة على الميت رجلاً كان أم أنثى.**
2. **أحكام القصاص في الجروح، والإصابات، والقتل، والديات، والعفو، والتعويض، والأطراف الصناعية، وغيرها.**

**المراجع**

1. **الثقافة الاسلامية** .عبد الصمد علي عبدالصمد
2. القرآن الكريم وصفوة التفاسير
3. فقه الطبيب- عمر عبد العزيز وآخرين
4. أي مراجع أخرى يقترحها أستاذ المادة، توافق عليها الكلية
5. مذكرات الكلية

**Coursetitle*:*** Arabic Language MLS-ARB-116

**Symbol and number:** ARAB-112 and 122

**Duration and credits:** 30 WEEKS 4 CHs

**Student coordinator:** [to be nominated in each batch]

Intended students: **Semester 1 , and Semester 2**

**Rationale**

A student or graduate dealing with Arab speaking patient in a country where this is an official language has to know all medical terms in Arabic (covered in other courses), and reads and writes the language with perfection that helps accurate referral and reports writings, especially those requested by the judicial system. The health service teams includes professional who do not speak a foreign language, the supposed leader of that team has to know how do they practice their role in health provision. Patients have the right to know all details about their illnesses, and it is not their mistake that a treating doctor is not capable of understanding Arabic verbs and nouns or explaining medical terms, especially those related to obtaining an informed consent.

Four hours every week for two semesters (two of them are SDLs). The details should include basic language rules that help the student express themselves, avoid common mistakes when writing articles and answering questions, apply grammatical rules on speech and recitation, particularly in stating scientific facts in Arabic, and know the sources of translation of medical terms, and the exact Arabic equivalent of all medical terms.

**General objectives**

By the end of this course, the student is expected to:

* Demonstrate basic Arabic language skills for correct understanding and pronunciation.
* Be able to correct of common errors in composition of sentences and vocabulary.
* Be able to avoid common mistakes when writing articles and answering questions.
* Apply grammatical rules on speech and recitation.

الأهداف الخاصة:

بنهاية هذا المقرر يتوقع من الطالب ان:

1. يقرأ ويكتب الجمل العربية صحيحة مستخدماً قواعد النحو، ومدركاً لمعانيها
2. يناقش أحكام الهمزة، والتاء المربوطة والمبسوطة، واللام الشمسية والقمرية، وكتابة الرسائل، وعلامات الترقيم.
3. يشرح معاني الفصاحة، والنعت في اللغة، والترادف، والمشترك اللفظي، والتضاد، والدخيل، والمعرب، والمولد، وعلم الأصوات.
4. يستخدم مخارج الحروف الصحيحة.

الأهداف الخاصة: (122).

1. يُعرب الجملة العربية، محدداً الأفعال والأسماء وحروف الجر والصفات والحال، والبناء للمجهول.
2. يختصر قطعة كبيرة تتجاوز الألفي كلمة في ملخص لا يتجاوز مائتي كلمة.
3. يحفظ القصيدة الشعرية المقررة.
4. يقوم بتعريب ثلاث قطع (حوالي 300 كلمة) من المنشورات الطبية باللغة الانجليزية للغة العربية، ومثلها من العربية للإنجليزية.

Recommended reading material:

-College notes

- Arabic Language Curriculum: the Skills and Rules

* د.عبدالرحمن إبراهيم، د.منيرة ابومنقة. اللغة العربية لغير المتخصصين.
* منهج اللغة العربية: مهارات، وفقه
* محمد عبد الصبور قة في تدريس اللغة العربية لغير طلاب التخصص،قسم اللغة العربية جامعة الملك سعود

<http://faculty.ksu.edu.sa/Dr.m.sabour/Pages/طريقةفيتدريساللغةالعربيةلغيرطلابالتخصص.aspx>

* شحاتة ، حسن سيد  ( 1996م ) . تعليم اللغة العربية بين النظرية والتطبيق ، القاهرة : الدار المصرية اللبنانية .
* يونس ، فتحي ، والناقة ، محمود كامل ( 1977م ) . أساسيات تعليم اللغة العربية ، القاهرة : دار الثقافة للطباعة والنشر .

**Coursetitle*:*** Anatomy

Course symbol and number:  **MLS-ANA-117**

Duration and credits: 15 weeks 2CHS

Intended students: **Semester 1**

**Prerequisites: Nil**

**General objectives:**

Upon the successful completion of this course the student will be able to: (1) describe and explain, at a basic level, the gross anatomy and introductory histology of the human body, especially the functional aspects of major tissues, organs, and systems including respiratory, cardiovascular, digestive, urinary, reproductive, endocrine and nervous with special emphasis on the interaction between these system and the major failures producing disease, with some formal laboratory sessions, and a self-directed optional human anatomy laboratory is running all the time for independent study, (2) fundamentals of human physiology in a systematic pattern: function of the nervous system (neurotransmitter, sensory and motor systems), endocrine gland and their secretions, bone and muscle physiology, cardiovascular, respiratory systems, gastrointestinal and renal physiology. In addition it emphasizes: (3) the characteristics, features and functions of neurons, ganglia, synapses, neuroeffector autonomic nervous system and somatic reflex arch, (4) the concepts, definitions, processes and mechanism of membrane potentials, somatic and autonomic transmission, receptor activation and production of response, (5) the structure, organization and regulation of adrenergic and cholinergic systems, (6) mechanisms (pathophysiology) of diseases related to cholinergic system (e.g. myasthenis gravis, periopheral neuropathy and diarrhea) and adrenergic system (e.g hypotension, pheochromocytoma and asthma), and (7) an introduction to drugs affecting the autonomic system, their mechanism of action, metabolism, side effects, structure-activity relationships and some clinical applications.

***Specific objectives***

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

1. Compare eurokaryotic and prokaryotic cells.

2. Describe the structure and function of cells organelles.

3. Compare mitotic cell divisions.

4. Describe how gametes develop.

5. List the various types of simples and stratified epithelium and quote examples.

6. Give examples of exocrine glands.

7. Name the hormone(S) produced by each endocrine gland...

8. List the various types’ connective tissues.

9. Compare between the different types of c.t with regards to cellular components and ground substances.

10. Describe the histological picture of bones, cartilages and blood cells .

11. List the various types of muscular tissues and a locate their position in the body .

12. Compare between the different types of muscles .

13.Describe the histological appearance of each types in a slide under the microscope .

14. Describe the neuromuscular junction and the anatomical basis of contraction .

15.Describe the neuron and list the various types of neurons .

16.Identify the different parts of nervous system .

17. Describe the other types of cells in the nervous system i.e neuroglical cells with referral to their functions.

18. Compare between the deferent types of muscles .

19. Describe the histological appearances of each types in a slide under the microscope .

20. Discuss the neuromuscular junction and the anatomical basis of contraction .

21. Mention different parts of the cardiovascular system .

22. Mention different chambers of the heart and discuss their relation to each other.

23. Discuss the pericardial covering of the heart.

24. Describe the internal structure and histological picture of the heart .

25. Identify great vessels and their location .

26. Describe and compare the histological picture of arteries and veins .

27. Describe the capillary network .

28. Identify different parts of the respiratory system .

29. Describe and identify on a slide under the microscope the histological built up of the different parts of R.S .

30. Discuss the mechanism of breathing on structural basis .

31. Identify the different parts of the gastrointestinal tracts with reference to their position in the abdominal cavity .

23.Describe and identify on a slide under the microscope the histological built up of the different parts of GIT .

33. Discuss the histological basis of the GIT function.

34. Discuss the portal circulation.

35. Mention the different parts of the urinary system with reference to their position in the abdomen and pevils .

36. Describe the nephron.

37 .Identify under the microscope the histological built up of the different parts of the urinary system.

38. Discuss thy histological basis of the function of the nephron .

39. Discuss histological basis of urine excretion.

40. Identify the different parts of the reproductive systems in both genders .

41. Describe and identify on slide under the microscope the histological built up of the different parts of reproductive systems.

42. Discuss the histological basis of the function preformed in each part of the male and female genital tracts.

***Educational Strategies and Methods:***

Lectures and practical

***Evaluation and Assessment Methods:***

Course work (Med semester exam +Assignment) = 30%

Final exam = 70%

***Required Resources:***

Class room.

Multimedia and microphone.

White board and pens.

***Recommended textbooks or/ and reading material:***

[**Gray, Henry. 2015. Anatomy of the Human Body**](http://www.bartleby.com/107/)**. 41st edition**

College notes

**Coursetitle*:*** Computer science

Symbol and number:  **MLS-COM-118**

**Duration and credits:** 30 weeks block, 3 CHs

Intended students: **Semester 1**

**Prerequisites:** Nil

**Outline**

The course is intensive focusing on the basic principles of computer electronics and applications relevant to health science education. This is done through hands-on experience in dealing with famous programs like DOS, Word, Excel, PowerPoint, Access and Internet Explorer. The use of CDs is stressed covered as well as having e-mails and navigating the internet for health information including how to access medical journals, and communicate with scientists worldwide.

## Rationale

Most of the textbooks of medicine and allied sciences are available on CDs, in which a large volume of knowledge is saved and easily retrievable. There are many software packages demonstrating methods and techniques in clinical skills including patient rapport in history taking, clinical examination, investigations and management. Students and teacher can access the internet for the unlimited sources of health information, both at their professional level and public level for health education. Medical laboratory students are educators who have to prepare smart documents and presentations for the health team and profession at large. Knowledge of programs like Word, Excel, and PowerPoint is indispensable for anyone learner or teacher. Computer is important for students both in the developed or developing world, more so for the latter, who might not have inherited voluminous libraries in their colleges and have to utilize the virtual libraries available all over the world. Medical journal as hard copies are difficult to be owned by one institution, now almost all are available on-line for those who can use the computer efficiently.

#### *General objectives*

**By the end of the course students are expected to:**

* Be familiar with the parts of the computer.
* Can use word processing, spread sheet and presentation programs.
* Add or remove programs following installation instructions.
* Add or remove upgrades and peripherals, when needed.
* Use internet to communicate and extract health information.

#### *Specific objectives*

**By the end of the course students are expected to:**

* Identify major components and chips, external connections and peripherals, upgrading options, and can buy a unit suiting particular use.
* Add and remove programs, and connect and disconnect peripherals.
* Create a Microsoft word document, make page margins, header and footer, charts, diagrams and graphics, and show ability to cut, copy and paste, find and replace, and add footnotes and bullets, spelling and grammar checks, fonts and colors, indenting, bullets, graphics and diagrams, templates and printing.
* Create workbooks and worksheets using Excel, and show ability to make rows and columns, edit data in worksheets, analyze data, filtering and sorting, formulas, and drawings and charts.
* Create slides by PowerPoint and make presentations, and show ability insert photos, clip arts charts, animation, and tables. It includes running presentations with transitions and timings settings, sound videos, printing handouts from presentations.
* Design a front-page and a webpage, and show ability to add web pages, use images on web pages, get reports on web status, create lists, bookmarks and Text Hyperlinks
* Define internet and mention its history and size and show ability to communicate and carry out search for health and general information.
* Make chapter summary, save information, download programs, view document off-line and create setup conclusion
* Get a file from FTP server, address FTP and send a file via FTP.

###### Recommended reading material

Computer science illuminated .Nell Dale, John Lewis

College notes

Course No. MLS –MAT-119

Course Title: Clinical Laboratory Mathematics

Credit hour: 2

Conducting during Semesters 1

Introduction:

Mathematics should help MD students in carrying out calculations and measurement and in quantitative analysis of their data; all of which are required in writing up reports of their research projects. Mathematics helps MD students to develop the following skills:-

* Numerical skills
* Observation skills
* Thinking skills
* Analytical skills
* Understanding logic
* Skills of comparing
* Skills of interpretation
* Problem solving skills
* Decision making skills
* Spatial analysis and interpretation
* Life skills
* Skills of educational games

**Basic Mathematics**

General Objectives:

To have successfully learned the material in this chapter, the student should be able to perform the following properly:

* Describe the organization of the number systems using Arabic numerals and Roman Numerals and the major uses of these two systems in the Clinical Laboratory.
* Manipulate signed numbers during addition, subtraction, multiplication, and division.
* Manipulate signed common and decimal fractional numbers during addition, subtraction, multiplication, and division.
* Convert common fractions to decimal fractions and vice versa.
* Manipulate percent values using addition, subtraction, multiplication, and division.
* Complete chain calculations using the proper order of calculations.
* Calculate values using simple algebra.
* Identify the significant figures in values and use proper techniques of rounding off results.
* Carry out algebraic manipulation of exponential numbers.
* Manipulate values expressed in scientific notation and convert values to and from scientific notation.

**Contents:**

* General concepts.
* Number systems.
* Arithmetic.
* Fractions.
* Order of Calculations.
* Algebra.
* Reciprocals.
* Significant Figures.
* Exponent .
* Scientific Notation.
* Ratio and Proportion.

**System of measure**

Objectives:

* Describe the concept measurement and the need of measurement in the Clinical Laboratory
* Describe the metric system, its organization of prefixes, and the manner of the assigning abbreviations and symbols to metric units.
* Convert metric values from prefix level to prefix level.
* Explain the organization and philosophy of the *system international d' unites* (SI).
* Demonstrate and understanding of basic and derived properties and the SI units by explanation and appropriate calculation.
* Describe the organization of the major nonmetric systems of measure, and relates these systems to SI system and other metric systems used in Clinical Laboratories.
* convert values given in one system of measure to equivalent values in other systems.
* Describe units of measure commonly used in the Clinical Laboratory in terms of their relationship to the applicable system of measure and the relationship of the unit to the system.

Contents:

* Educational Objectives.
* Introduction.
* Metric System.
* SI System.
* Nonmetric System of measure.
* Conversions from One Unit of Measure to Another.

**Temperature Conversions**

General Objectives:

* Conversion between degree Celsius and degree Kelvin.
* Conversion between degree Celsius and degree Fahrenheit.
* Conversion between degree Fahrenheit and degree Kelvin.

Specific Objectives:

* Differentiate between temperature and heat.
* Differentiate among Fahrenheit, Celsius, and Kelvin temperature.
* Relate the size and reference point of the degree among the three scales.
* Convert temperature give in one scale to equivalent values in the other two scales.

**Factors**

General Objectives:

* Factors used to express a Quantity of one substance as an Equivalent Quantity of another substance.
* Factors used to allow for differences in color Equivalents or Molecular differences.
* Factors used to combine many calculations into a single process.
* Correction for variation in procedure quantities.

Specific Objectives:

* Define factor as the term is used in applied mathematics and give some examples of the use of factors in the Clinical Laboratory.
* Calculate the factor that can be used to express the quantity of one substance as an equivalent quantity of a related substance.
* Calculate the factor that will accommodate differences in the color equivalents of two substances.
* Develop a factor that will combine a stiing of calculation into a single calculation.
* Develop a factor to correct for a variation in a procedure or reagent.

**Dilutions**

General Objectives:

* Describe particular dilution in terms of its ratio of component substances.
* Recognize various expressions of a dilution as different descriptions of the same mixture.
* Calculate the absolute amount of the substance in a given volume of a dilution.
* Calculate the amount of a substance needed to make a given volume of a particular dilution.
* Determine the final dilution of a mixture after adding substances to a known mixture.
* Make a dilution series, and determine the concentration at each step in the series.
* Calculate the total volume expected from addition.
* Describe the procedure for making a dilution series, and calculate the concentration and total volume of each dilution in the series.
* Describe the procedure for making a series of tube dilutions, and determine the concentration and total volume of each dilution in the series.
* Differentiate between tube dilutions and solution dilutions.
* Determine the substance concentration of a dilution.
* Procedure dilutions with prescribed concentrations and volumes.
* Describe the procedure for making a two-fold serial dilution.
* Determine a titer of an antibody by dilution.

Specific Objectives:

* Calculations involving one dilution.
* Dilution series.
* Dilution with prescribed concentrations and/or volumes.
* Serial Dilutions.
* Special dilution problems.
* Dilution as an expression of test Endpoint (Titers).

**Solutions**

General Objectives:

* Describe the major types of solutions.
* Describe the types and components of solutions in accepted nomenclature.
* Differentiate among the types of concentration expression used in describing biological solutions.
* Calculate the concentration of a solution , and express this concentration in several ways.
* Calculate the amount of one solution needed to make a solution of lesser concentration.
* Calculate the concentration of a solution resulting from a mixture of two solutions.
* Accommodate various hydrates of a solute in the preparation of solutions of given concentrations.
* Differentiate among parts and percent concentration described in terms of weight per unit weight, weight per unit volume, and volume per unit volume.
* Calculate the Molarity of a solution that has a concentration expressed in other ways.
* Differentiate between Molarity and Molality, and describe where these expressions are used in the Chemical and Clinical Laboratory.
* Determine the gram equivalent weight of ionic substances, and use this result to make a solution of given normality.
* Determine the mass of one osmole of a substance, and describe a procedure to produce a solution of given Osmolarity and volume.
* Determine the Osmolarity of a solution from its freezing-point depression.
* Determine the concentration of a solution from its density.
* Convert concentration expressions from one for to others.

Specific Objectives:

* Expression of concentration.
* Solution calculations.
* Parts Calculations.
* Percent Concentration.
* Molarity.
* Molality.
* Normality.
* Osmolarity.
* Density.
* Conversion from one expression of concentration to another.

**Logarithms**

General Objectives:

* Describe the relationship between a logarithm and a complete number.
* Differentiate between Briggs (common) and Naperian (natural) logarithms.
* Convert Naperian logarithms to Briggs logarithms.
* Identify the characteristic and mantissa of a logarithm.
* Determine the common logarithm of a number using a table of mantissa.
* Determine the antilogarithm of both positive and negative logarithms using a table of mantissas.
* Multiply numbers using logarithms.
* Divide numbers using logarithms.

Specific Objectives:

* Determinating the characteristic.
* Determinating the Mantissa.
* Determinating Antilogarithms.
* Negative Logarithms.
* Calculations using logarithms

**Ionic Solutions**

General Objectives:

* Use of pH.
* Acid-Base relationships.
* Use of cH.

Specific Objectives:

* Define Acid, Base, and Salts.
* Describe the major concepts of the sørensen pH and pOH scales, and relate this to the dissociation of water as [H+] X [OH-] = 1 X 10-14.
* Convert molar concentration of free hydrogen ions in an aqueous solution to pH.
* Calculate the pH of ionic solutions from concentrations and dissociation or ionization constants of solutes.
* Describe a procedure to produce a solution of a given pH and volume.
* Calculate Total CO2 from the pH and Pco2 of a solution.
* Convert pH to cH using an electronic calculator.
* Calculate the pH of a buffered solution.
* Buffer Systems

**Colorimetry**

General Objectives:

* Visual Colorimetry (Inverse Colorimetry).
* Photometric Colorimetry (Direct Colorimetry).
* Relationship between Absorbance and %T.
* Absorbance and its relationship to molar absorptivity.

Specific Objectives:

* State Beer's Law, and describe the relationship included in this principles.
* Determine the concentration of a substance in solution using inverse Colorimetry.
* Determine the concentration of a substance in solute direct in Colorimetry.
* Describe the relationship between absorbance and transmittance.
* Convert absorbance to percent transmittance.
* Calculate the concentration of a substance in absorptivity coefficients.

**Graphs and Standard Curves**

Specific Objectives:

* Describe the current use of graphs and standard curves in the Clinical Laboratory.
* Describe the organization of linear, semilog, and log-log graph.
* Establish Standard curve using a set of data.
* Calculate the concentration of substance in solution using a standard curve.

Contents:

* Graphs.
* Standard Curves.
* Procedure for establishing a Standard Curves.
* Plotting the Standard Curves.
* Use of reference Blank solutions.
* Serum Controls.

**Hematology Math**

Specific Objectives:

* Calculate the dilution factor for an amount of blood diluted with white blood cell (WBCs), and Red Blood Cells (RBCs).
* Calculate the final factor used to convert a blood count from a Neubuaer Hemocytometer to the number of cells per microliter of blood.
* Correct a white count for nucleated red blood cells (nRBCs).
* Calculate the final factors used to convert blood counts from the Fuchs-Rosenthal and Speirs-Levy Hemocytometer to the number of cells per microliter of blood.
* Calculate the mean corpuscular volume, mean corpuscular hemoglobin, and mean corpuscular hemoglobin concentration from the hemoglobin, hematocrit, and RBCs count.
* Establish a hemoglobin curve using the aqueous standard, or Cyanmethemoglobin, method.

Contents:

* Hemocytometer.
* Indices.
* Hemoglobin Curve using the Cyanmethemoglobin (Aqueous Standard).

**Enzyme Calculations**

Specific Objectives:

* Describe the relationship between enzyme activity and the change in the absorbance of a reacting solution.
* Calculate the international unit (IU) of an enzyme from a change in absorbance of a substrate during an enzyme reaction.
* Convert King-Armstrong acid phosphatase units to international units per liter.
* Calculate enzyme units using the molar extinction coefficient of a reaction product.

Contents:

* Kinetic Method.
* International Unit.
* Conversion of Conventional units to international units.
* Computation of Enzyme units.

**Gastric Acidity**

General Objectives:

* Determination of Acid Concentration.
* Calculations of Gastric Acidity.
* Determination of free Acid Output.
* Calculations of free Acids Outputs.

Specific Objectives:

* Differentiate among combine acid, free acid, total acid, and titrable acidity.
* Calculate the degrees of acidity per 100 millimeters, milliequivalents, per liter, and millimoles per liter from the titration of a small sample of gastric material.
* Explain the variation among the procedures used to calculate basal acid output (BAO), maximum acid output (MAO), and peak acid output (PAO).
* Calculate BAO, MAO, PAO, and BAO/MAO ratio from gastric samples.

**Renal Tests**

Specific Objectives:

* Calculate the renal clearance of creatinine in terms of milliliters of plasma cleared per minute.
* Calculate the renal clearance in a percent of normal.
* Determine the body surface of an individual by using a nomogram and calculation.
* Adjust a renal clearance for body surface.
* Determine an amount of test substance per total volume in a timed urine specimen.
* Determine an amount of a test substance per given time in a timed urine specimen.

Contents:

* Renal Clearance tests.
* Timed Urine values.

**Quality Control**

Specific Objectives:

* Describe the need for quality control in the Clinical Laboratory.
* Differentiate between parameters and statistics.
* Calculate the mean, median, and mode of a set of variables.
* Calculate the Standard Deviation and Coefficient of variation of a set of variables.
* Describe the organization of the normal distribution and the Levey-Jennings Charts in term s of the relationship between the mean and Standard Deviation of variation of a set of data.
* Describe how a normal distribution is used to evaluate a series of laboratory results.
* Plot a set of test results with controls on a Levey-Jennings Charts and determine whether the procedure is in or out of controls.

Contents

* Statistical Terminology.
* Calculated Statistical value.
* Normal Distribution.
* Ẍ or Levey- Jennings chart.

Text and reference Books:

* Laboratory Mathematics Medical and Biological Application. Joe Bill Campbell; 5th Edition 1997. Mosby.

Methods of assessment:

* Continuous Assessment (C.A.) 20%.
* MCQs (SBA) 20%
* Structural Short Answers (SSA) 20%
* Extended Matching Questions and problems 20%
* Practical examination 20%

|  |
| --- |
| **Semester Two**  **Syllabus** |

**Cell Biology and Genetics**

Course No. MLS 126

Code: Cell Bio.

Course Title: Cell & Human Biology

Credit hour: 3

General Objectives:

This educational unit is expected to introduce students to basic biological concepts such as cell structure and division, integration of biochemical pathways responsible for generation, storage and utilization of energy in addition to gene expression and introduction to molecular biology and its relation to Dentistry.

Specific Objectives:

By the end of this educational unit, the student should be able to:

1. Explain scientific method and its use in systematically organizing knowledge.
2. Distinguish between asexual and sexual reproduction.
3. Describe the structure of a chromosome, prior to the start of cell division & duplicated chromosome.
4. Describe the normal karyotype of a human being and differentiate between male and female karyotype?
5. Distinguish between haploid and diploid organisms, and define homologous chromosomes.
6. Define the terms gene, allele, locus, genotype, phenotype, dominant, recessive, homozygous, heterozygous, and test cross.
7. Discuss monohybrid and dihybrid crosses, and relate them to Mendel’s laws.
8. Solve problems in genetics involving incomplete dominance, polygenes, multiple alleles, and sex-linked traits.
9. Discuss how a single gene may affect many aspects of the phenotype.
10. Discuss ways in which genes may interact to affect the appearance of a single trait.
11. Discuss the phenomena of linkage and crossing over, and solve problems involving linked genes and mapping.
12. Discuss the genetic determination of sex and the role of the Y- chromosomes in determining maleness.
13. Distinguish between sex influenced, sex-limited and sex-linked genes.
14. Compare inbreeding and out breeding, and discuss the genetic basis of hybrid vigor.
15. Identify the properties, the chemical nature and the requirements of a genetic material replication.
16. Relate the physical and chemical features of DNA to its function as genetic material.
17. Compare the organization of DNA in chromosomes in prokaryotic and eukaryotic cells.
18. Cite the significance of DNA replication features to cell divisions (meiosis & mitosis) and how it ensures to preserve the information generation after generation.
19. Outline the flow of genetic information in cells from DNA to protein.
20. Identify the different types of RNA.
21. Compare the structure of DNA and RNA, and explain how the structure of each is related to its role in the cell.
22. Outline the general characteristics of the genetic code.
23. Compare eukaryotic and prokaryotic mRNA.
24. Identify the different classes of mutations that affect the base sequence of DNA and the effect of each on protein product.
25. Distinguish between environmentally induced and inherited abnormalities.
26. Identify normal human male and female karyotype.
27. Identify the different types of chromosomal abnormalities, the pattern of single-gene inheritance, autosomal inheritance and linked inheritance.
28. Compare non-disjunction in meiosis and mitosis.
29. Explain the genetic basis for all blood groups and for Rh (-D) factor.
30. Summarize current concepts of the control of gene function in prokaryotes and eukaryotes, with emphasis on the operon model of prokaryote gene regulation.
31. Describe the structure of eukaryotic gene and the DNA sequences involved in the regulation of that gene.
32. Outline the evident role of genetic induction and repression in eukaryote development.
33. Define the restriction enzyme and explain how these enzymes act and their use in recombinant DNA.
34. Summarize the properties of cloning vector, different procedures for isolating a specific gene and explain how a gene of interest could be cloned.
35. Define the different types of human DNA libraries.
36. Identify the potential applications of recombinant DNA technology.
37. Recognize the anatomical position & names, general body directions, planes and sections.
38. Distinguish between body cavities and describe homeostasis.
39. State the structure and function of the skin.
40. Label a diagram of the digestive system and its structure and give function of each structure.
41. State the types of teeth and draw the structure of a tooth.
42. List in sequence each structure through which a bit of food passes as it makes its way through the digestive tract and describe the four layers of the wall of the digestive tract.
43. Summarize the types of digestive enzymes and juices and their role in digestion of carbohydrates, lipids and proteins.
44. Comment briefly on absorption of products.
45. List functions of the circulatory system, the principal components of human blood, giving the function of each component.
46. Summarize the events involved in blood clotting.
47. List the functions of the lymphatic system describe how this system operates to maintain fluid balance.
48. Trace the flow of information through the nervous system and describe the principal divisions of the human nervous system.
49. Identify the structures that protect the human brain and spinal cord.
50. Describe the different parts of spinal cord and brain and their respective functions.
51. Describe the reflex arc process and the structure and function of the peripheral nervous system (somatic and autonomic).
52. Label the structures of the human ear and eye on a diagram, and give the functions of each.
53. Compare the function of the saccule and utricle with that of the semicircular canals in maintaining equilibrium.
54. Trace the path taken by sound waves through the ear and the role of organ of corti to function as an auditory receptor.
55. Describe the photoreceptors and their function.
56. Define the terms: hormone and endocrine glands, and identify sources of hormones other than endocrine glands.
57. Characterize hormones chemically, giving examples of hormones derived from amino acids and fatty acids, and examples of peptide, protein, and steroid hormones.
58. Identify the principal endocrine glands, list the hormones secreted by each, and summarize their actions.
59. Explain why the hypothalamus is considered the link between nervous and endocrine systems, and describe the mechanisms by which the hypothalamus influences the anterior and posterior lobes of the pituitary gland.
60. Trace the passage of sperm cells through the male reproductive system from their origin in the seminiferous tubules until they leave the body in the semen.
61. Identify the structures of the male and female reproductive systems on a diagram, and give the function of each.
62. Trace the development of an ovum and its passage through the female reproductive system until it is fertilized.
63. Describe the actions of testosterone and of the gonadotropic hormones in the male.
64. Give the reasons why respiratory system is essential for the life of the human body.
65. Describe the pathway of air in ventilation and describe the structure and functions of respiratory system.
66. Summarize the mechanisms of quiet and forced breathing.
67. Summarize the neural control of respiration in relation to CO2, pH and O2 content of the blood.
68. Describe the location and the principal parts of the kidney and nephron, and give general functions of the urinary system.
69. Describe the process of urine formation, comparing filtration, re absorption, and secretion of various substances, especially water, sodium, urea, glucose, amino acids, potassium and hydrogen ion.
70. Describe the countercurrent exchange, and explain the importance of this mechanism.
71. Describe the effects of each of the following on the volume and composition of urine: antidiuretic hormone, aldosterone, low fluid intake, and high salt intake.

Contents:

Summary:

- living and non-living things- The cell structure and division and its organelles – structure of the viruses, bacteria, fungi, vertebrates, biology of arthropod and insect vectors- principles of genetics – principles of molecular biology and its branches - metabolism and Biochemical Pathways responsible for Generation, Storage and Utilization of Energy – reproduction in mammals – Gene Expression, its regulation and recombinant DNA Technology- the nervous system-

the cardiovascular system – respiratory system – hormones and the kidney – life cycle of the common parasite- the sequence and levels of biological organization by constructing a hierarchy including individual and ecological levels.

Practical: principles of scientific drawing – structure and function of common parasites - structure and function of vertebrates.

Contents details:

1. Scientific method and its use in systematically organizing knowledge.
2. Asexual and sexual reproduction.
3. The structure of a chromosome, prior to the start of cell division & duplicated chromosome.
4. Normal karyotype of a human being and differences between male and female karyotype
5. Haploid and diploid organisms, and definition of homologous chromosomes.
6. Defining the terms gene, allele, locus, genotype, phenotype, dominant, recessive, homozygous, heterozygous, and test cross.
7. Monohybrid and dihybrid crosses, as relating to Mendel’s laws.
8. Problems in genetics involving incomplete dominance, polygenes, multiple alleles, and sex-linked traits.
9. Single gene affecting many aspects of the phenotype.
10. Genes interactions and their affect on trait.
11. Phenomena of linkage and crossing over, and problems involving linked genes and mapping.
12. Genetic determination of sex and the role of the Y- chromosomes in determining maleness.
13. Contrasting sex influenced, sex-limited and sex-linked genes.
14. Comparing inbreeding and out breeding, and discussing the genetic basis of hybrid vigor.
15. Properties, chemical nature and requirements of a genetic material replication.
16. Physical and chemical features of DNA and its function as genetic material.
17. Organization of DNA in chromosomes in prokaryotic and eukaryotic cells.
18. Significance of DNA replication features to cell divisions (meiosis & mitosis) and the way it preserves the information generation after generation.
19. The flow of genetic information in cells from DNA to protein.
20. Different types of RNA.
21. Compare the structure of DNA and RNA, and explaining how the structure of each is related to its role in the cell.
22. General characteristics of the genetic code.
23. Eukaryotic and prokaryotic mRNA.
24. Different classes of mutations that affect the base sequence of DNA and the effect of each on protein product.
25. Distinguishing between environmentally induced and inherited abnormalities.
26. Normal human male and female karyotype.
27. Types of chromosomal abnormalities, the pattern of single-gene inheritance, autosomal inheritance and linked inheritance.
28. Comparing non-disjunction in meiosis and mitosis.
29. Genetic basis for all blood groups and for Rh (-D) factor.
30. Current concepts of the control of gene function in prokaryotes and eukaryotes, with emphasis on the operon model of prokaryote gene regulation.
31. Structure of eukaryotic gene and the DNA sequences involved in the regulation of that gene.
32. The evident role of genetic induction and repression in eukaryote development.
33. The restriction enzyme and explaining how these enzymes act and their use in recombinant DNA.
34. Properties of cloning vector, different procedures for isolating a specific gene and explaining how a gene of interest could be cloned.
35. Different types of human DNA libraries.
36. Potential applications of recombinant DNA technology.
37. Anatomical position & names, general body directions, planes and sections.
38. Distinguishing between body cavities and describing homeostasis.
39. Structure and function of the skin.
40. Diagram of the digestive system and its structure and functioning of each structure.
41. Types of teeth and drawing the structure of a tooth.
42. Sequence of each structure through which a bit of food passes as it makes its way through the digestive tract and describing the four layers of the wall of the digestive tract.
43. Types of digestive enzymes and juices and their role in digestion of carbohydrates, lipids and proteins.
44. Absorption of products.
45. Functions of the circulatory system, the principal components of human blood, and the function of each component.
46. Events involved in blood clotting.
47. Functions of the lymphatic system and how this system operates to maintain fluid balance.
48. Flow of information through the nervous system and the principal divisions of the human nervous system.
49. Structures that protect the human brain and spinal cord.
50. Different parts of spinal cord and brain and their respective functions.
51. The reflex arc process and the structure and function of the peripheral nervous system (somatic and autonomic).
52. Structures of the human ear and eye on as shown by diagrams, and their functions.
53. The function of the saccule and utricle and their comparison with that of the semicircular canals in maintaining equilibrium.
54. The path taken by sound waves through the ear and the role of organ of corti to function as an auditory receptor.
55. Photoreceptors and their function.
56. Hormone and endocrine glands, and the sources of hormones other than endocrine glands.
57. Chemical characterization of hormones, and examples of hormones derived from amino acids and fatty acids, and examples of peptide, protein, and steroid hormones.
58. Principal endocrine glands, the hormones secreted by each and their actions.
59. Why the hypothalamus is considered the link between nervous and endocrine systems, and the mechanisms by which the hypothalamus influences the anterior and posterior lobes of the pituitary gland.
60. Passage of sperm cells through the male reproductive system from their origin in the seminiferous tubules until they leave the body in the semen.
61. Structures of the male and female reproductive systems on a diagram, and their functions.
62. The development of an ovum and its passage through the female reproductive system until it is fertilized.
63. Actions of testosterone and of the gonadotropic hormones in the male.
64. Why respiratory system is essential for the life of the human body.
65. The pathway of air in ventilation and the structure and functions of respiratory system.
66. Mechanisms of quiet and forced breathing.
67. Neural control of respiration in relation to CO2, pH and O2 content of the blood.
68. The location and the principal parts of the kidney and nephron, and the general functions of the urinary system.
69. The process of urine formation, comparing filtration, re absorption, and secretion of various substances, especially water, sodium, urea, glucose, amino acids, potassium and hydrogen ion.
70. Countercurrent exchange, and the importance of this mechanism.
71. The effects of each of the following on the volume and composition of urine: antidiuretic hormone, aldosterone, low fluid intake, and high salt intake.

Text and reference Books:

* Instant notes on molecular biology, P.C. Turner et al, 1998. School of biological Sciences, Liverpool
* Purification of Nucleic Acids, in : Molecular Cloning, thirteen ed. T. Maniatis, et al .1986. Cold Spring Harbor Laboratory, New York
* Cell Biology and Genetics, by Cecie Starr and Ralph Taggart Brooks Cole; 11th ed (September 19,2005)
* Harvey Lodish m Arnold Berk, Paul Matsudaria, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Lawrence Zipursky and James Darnell. W. H. Freeman; (August 1, 2003); Molecular Cell Biology, 5th ed.

Methods of assessment:

* Continuous Assessment (C.A.) 20%.
* MCQs (SBA) 20%
* Structural Short Answers (SSA) 20%
* Extended Matching Questions and problems 20%
* Practical examination 20%

Course No. MLS-BIO-121

Course Title: Biochemistry

Credit hour: 3 (2 Theory + 1 Practical)

Conducting during Semesters 2

Introduction :

These allied dental curriculum guidelines provide an overview of the function and food sources of nutrients essential to systemic and oral health with an emphasis on the role of nutrition in the development and maintenance of the oral tissues through the life cycle.

General objectives:

Following curriculum completion the student is expected to:

1. Identify the function and food sources of nutrients essential to systemic and oral health with an emphasis on the role of nutrition in the development and maintenance of hard and soft oral tissues.
2. Demonstrate foundational knowledge of nutritional needs throughout the life cycle and the role of nutrition in the prevention and management of both systemic and oral disease.
3. Demonstrate the implementation of effective approaches to dietary assessment and nutrition counseling in the dental clinic.

Specific Objectives:

At the completion of this course, the student will be able to:

1. Explain the role of nutrition in the synthesis and maintenance of the oral tissues.
2. Name the classes of essential nutrients, their general function in the growth and development of oral tissues, and food sources of each nutrient.
3. Describe the role of diet in the initiation and progression of dental caries and periodontal disease.
4. Describe nutrition issues that may impact oral health throughout the life cycle.
5. Discuss dietary measure that may prevent or delay the onset of chronic disease as well as oral diseases.
6. Explain dietary goals for people with chronic disease such as obesity diabetes, hypertension, and cardiovascular disease and how they might impact oral health.
7. Demonstrate appropriate nutrition assessment and dietary counseling techniques for the treatment of nutrition-related dental diseases.
8. Use computer software to determine the nutrient content of his/her own diet, and use nutrient intake guidelines appropriately to evaluate the diet.
9. Identify food factors and eating patterns that may contribute to the development of caries and/or impact healing of oral tissues.
10. Propose appropriate dietary recommendations for a dental patient.

Contents:

* 1. Nutrition Basics

1. Introduction to the connection between oral health and nutrition
2. Guidelines for nutrient intake
3. National standards for planning and assessing nutrient intake
4. Dietary Reference Intakes (DRI)
5. Recommended Dietary Allowance (RDA)
6. Adequate Intake (AI)
7. Upper Tolerable Levels (UL)
8. Guidelines to plan adequate diets
9. Food Guide Pyramid
10. US Dietary Guidelines for Americans
11. Nutritional status of Americans
12. Food and nutrient intake trends
13. Cultural aspects of dietary planning
14. Food labeling
15. Review of digestion and absorption
16. Digestive process
17. Mouth
18. Stomach
19. Small & large intestine
20. Overview of digestion and absorption of nutrients
21. Factor affecting digestion and absorption
22. Energy balance
23. Components of energy expenditure
24. Calculating energy expenditure
25. Recommended energy requirements
26. Energy value of nutrients
27. Weight management
28. Assessing weight and body composition
29. BMR
30. Overnutrition
31. Obesity
    1. Causes
    2. Systemic & oral health implications
    3. Approaches to weight control
32. Undernutrition
33. Implications for oral health
34. Macronutrients
35. Carbohydrates
36. Major functions in the body
37. Chemistry and classification
38. Monosaccharides
39. Disaccharides
40. Polysaccharides
    1. Starch
    2. Fiber
41. Alternative sweeteners
42. Digestion, absorption and transport
43. Metabolism
44. Dietary requirements
45. Recommended Dietary Reference Intake (DRI)
46. Food sources
47. Trends in consumption
    1. Implications for systemic health
    2. Implications for oral health
48. Proteins
49. Major functions of dietary protein
50. Chemistry and classification
51. Amino acids
    1. Essential amino acids
    2. Non-essential amino acids
52. Protein metabolism
53. Evaluation food protein quality
54. Dietary intakes
55. Recommended Dietary Reference Intake (DRI)
56. Food sources
57. Trends in consumption
    1. Implications for systemic health
    2. Implications for oral health
58. Lipids (Fats)
59. Major functions of dietary fat
60. Chemistry and classification
61. Saturated fatty acids
62. Monounsaturated fatty acids
63. Polyunsaturated fatty acids
    1. Essential fatty acids
64. Digestion, absorption and transport
65. Metabolism
66. Requirements
67. Recommended Dietary Reference Intakes (DRI)
68. Food sources
69. Trends in consumption
    * 1. Implications for systemic health
      2. Implications for oral health
70. Water & electolytes
71. Major functions in the body
72. Water balance
73. Micronutrients
74. Minerals
75. Macrominerals (calcium, phosphorus, magnesium, sodium, potassium, chlorine, and sulfur)
76. Major functions
77. Absorption and metabolism
78. Requirements
    1. Recommended Dietary Allowance (RDA)
    2. Upper Tolerable Levels (UL)
    3. Sources

* Food
* Supplements
  1. Oral and systemic implications
* Deficiency
* Excess

1. Microminerals (iron, zinc, copper, iodine, fluorine, manganese, cobalt, molybdenum, selenium, chro-mium, silicon, vanadium, nickel, and tin)
2. Major functions
3. Absorption and metabolism
4. Requirements

Recommended Dietary Allowance (RDA)

Upper Tolerable Levels (UL)

Sources

* Food
* Supplements

Oral and systemic implications

Deficiency

Excess

1. Vitamins
2. Water soluble vitamins
3. Function of B-complex and C
4. Chemistry and classification
5. Requirements

Recommended Dietary Allowance (RDA)

Upper Tolerable Levels (UL)

Sources

* + Food
  + Supplements

Oral and systemic symptoms

* + Deficiency
  + Excess

1. Fat soluble vitamins
2. Function of A, D, E and K
3. Chemistry and classification
4. Requirements
   1. Recommended Dietary Allowance (RDA)
   2. Upper Tolerable Levels (UL)
   3. Sources
   * Food
   * Supplements
   1. Oral and systemic implications
   * Deficiency
   * Excess
   1. Nutrition Care Process
5. Nutrition screening
6. Determining which patients will benefit
7. Nutrition Screening Initiative (NSI)
8. Identify patients at risk for poor nutritional status
9. Nutrition assessment
10. Components of assessment
11. Physical assessment
12. Weight & general appearance
13. Mobility
14. Medical history
15. Conditions/diseases that impact nutrient intake
16. Drug-nutrient interactions
    1. Prescription medications
    2. Over-the-counter medications
    3. Herbal and supplement use
17. Dental history
18. Oral conditions impacting nutritional intake
19. Significant changes in oral health
20. Social history
21. Socioeconomic status
22. Living situation
23. Dietary changes or restrictions
24. Dental clinical examination
25. Change in caries incidence
    1. GERD
    2. Eating disorders
    3. Xerostomia
26. Unexplained oral lesions noted during extraoral/intraoral examination
27. Periodontal disease out of proportion to local factors
28. Evaluation of the diet
29. Determining past eating patterns
30. Methods for determining present dietary adequacy
    1. 3-7 Day Food Record
    2. 24 hour Dietary Recall
31. Assess cariogenicity of the diet
32. Nutrient analysis
    1. Food Guide Pyramid
    2. Dietary Guidelines for Americans
    3. Computer diet assessment
33. Diet and/or nutrition counseling
34. Identify the priority issues
35. Enlist the patient in setting small measurable goal
36. Generate strategies for reaching goals
37. Follow-up to assess progress and set new goal
38. Nutrition referral
39. Recognize complex issues and refer to MD and registered dietitian
    1. Life Cycle Nutrition and Oral Health Issues
40. Nutrition in pregnancy and lactation
41. Infant and childhood nutrition
42. Failure to Thrive (FTT)
43. Prematurity
44. Implications for nutrition and oral health
45. Enamel hypoplasia
46. Feeding issues
47. Early Childhood Caries
48. Incidence
49. Identifying high risk feeding behaviors
50. Preventive strategies
51. Developmentally disabled
52. Delays in age appropriate feeding skills
53. GERD
54. Polypharmacy
55. Issues in adolescence
56. Eating Disorders
57. Oral manifestations
58. Referral
59. Osteoporosis prevention
60. Nutrition counseling to support attainment of peak bone mass
61. Issues in adulthood
62. Basic dietary recommendations in medical conditions/disease
63. Diabetes mellitus
64. Cardiovascular disease/hypertension
65. Gastrointestinal issues
66. GERD
67. Lactose intolerance
68. Substance abuse
69. Cancer
70. Polypharmacy
71. Effects of drugs on nutritional status
72. Xerostomia
73. Issues with implications for wound healing
74. Invasive dental treatment
75. Surgery
76. Extensive root debridement
77. Extractions
78. Oral lesions
79. Aphtous ulcers
80. Herpetic lesions
81. Mucositis/stomatitis
82. Other
83. NUG
84. Dietary recommendations
85. Soft and liquid diets
86. High calorie/high protein diets
87. Nutritional considerations in aging
88. Oral health status & impact on nutrient intake
89. Tooth loss
90. Adjusting to dentures
91. Bone loss
92. Root caries
93. Hypersensitivity
94. Tooth mobility
95. Polypharmacy
96. Xerostomia
97. Psychosocial issues
98. Depression & isolation
99. Functional issues
100. Tissue changes
101. Taste
102. Saliva flow
103. Mucous membranes
104. Gastrointestinal changes
105. Changes in GI acidity
106. Loss of gastric intrinsic factor
107. Changes in immune response

Text and reference Books:

* VK Malhorta; (2003); Biochemistry for students: 11th ed.
* Lubert Stryer, W.H Freeman & company- New York Stanford university.
* Pamela c. champe - Richard A. Harvey; (2005); Lippincott's illustrated reviews; Biochemistry. J.B. Lippincott company
* VK Malhorta; (2003); Practical Biochemistry for students: 4th ed.
* Allan Gaw; (2005) Clinical Bacteriology, Churchill liningstone.
* Murray Robert K; (2000); Harper's Biochemistry.

Methods of assessment:

* Continuous Assessment (C.A.) 20%.
* MCQs (SBA) 20%
* Structural Short Answers (SSA) 20%
* Extended Matching Questions and problems 20%
* Practical examination 20%

**Histology**

Course No. MLS-HIST-124

Course Title: Histology

Credit hours: 3

Conducting during Semesters 2

Introduction:

Histology is the study of tissues and their structure. Disease processes affect tissues in distinctive ways, which depend on the type of tissue, the disease itself and how it has progressedThis free course provides an introduction to histology, the study of tissues. It also describes how histology can aid in the diagnosis of disease and explains how histology services are organised within a hospital.When you have completed this unit, you should be able to:

* define all the terms given in bold
* outline the services provided by a hospital histology laboratory, and who uses them
* outline the processes involved in the preparation of tissue sections and explain the purpose of each of these processes
* identify a number of basic tissue-types from their microscopic appearance
* understand why histology is essential for accurate diagnosis and monitoring of disease progression.

This free course provides an introduction to histology, the study of tissues. It also describes how histology can aid in the diagnosis of disease and explains how histology services are organised within a hospital.

When you have completed this unit, you should be able to:

* define all the terms given in bold
* outline the services provided by a hospital histology laboratory, and who uses them
* outline the processes involved in the preparation of tissue sections and explain the purpose of each of these processes
* identify a number of basic tissue-types from their microscopic appearance
* understand why histology is essential for accurate diagnosis and monitoring of disease progression.

General Objectives:

1. Know the different histological techniques.
2. Know the different normal tissues of the body.
3. Be able to identify the tissues from different organs.

Contents:

1. Theory
   1. Introduction to histological techniques.
   2. Epithelium tissue.
   3. Connective tissue.
   4. Cartilage tissue.
   5. Bone tissue.
   6. Muscle tissue.
   7. Nerve tissue.
   8. Joints.
   9. Lymphoid tissue:

Lymph node

Spleen

Thymus.

* 1. Blood elements and blood vessels.
  2. Respiratory system.
  3. Digestive tract lips, tongue.
  4. Salivary glands.
  5. General arrangement of the gut wall.
  6. Esophagus & stomach.
  7. Duodenum, small and large intestine.
  8. Liver, pancreas and gall bladder.
  9. Urinary system, kidney.
  10. Ureter and bladder.
  11. Endocrine system, pituitary glands.
  12. Thyroid, parathyroid and suprarenal glands.
  13. Female reproduction:
      + Ovary
      + Uterus
      + Menstrual cycle.
  14. Male reproduction:
      + Testis.
      + Prostate.
  15. Skin and appendages of skin, mammary gland:
      + Sweat glands.
      + Nails.

1. Practical*:*
   * + 4 hours sessions every week. Student to see slide of the topic covered in the lectures.

Text and reference Books:

* Histology for Medical Students - Part 1& 2, Zakaria Abd Elhamid.

Methods of assessment:

* Continuous Assessment (C.A.) 20%.
* MCQs (SBA) 20%
* Structural Short Answers (SSA) 20%
* Extended Matching Questions and problems 20%
* Practical examination 20%

الدراسات السودانية

Course No. MLS-SUD- 128

Code: Sud. Stud.

Course Title: الدراسات السودانية

Credit hour: 2 (theory)

Conducting during Semesters 4

**الهدف من تدريس الكورس:**

1. تمكين الطالب من معرفة المعالم والحضارات الأساسية في تاريخ السودان ومملكة نبتة.
2. تقوية إحساس الطلاب بالوحدة وإذكاء الشعور القومي فيهم.
3. تعريف الطلاب بخصائص الشخصية السودانية ومكوناتها.
4. إجلاء الحقائق عن الموارد الطبيعة في السودان.
5. تعريف الطلاب بواقع الحياة الإقتصادية في السودان وتطورها.
6. إطلاع الطلاب على فلسفة التعليم العام في السودان وأهم تطوارتها.
7. تمكين الطلاب من الثقافة البيئية وتفهم مشكلات البيئة محلياً واقليمياً و إمتثال سلوك المواطن الصالح وحسن إستغلال الموارد.
8. حث الطلاب على المساهمة فى صيانة بيئاتهم التى وفدوا منها وحسن إستغلال مواردها.
9. تمكين الطلاب من الأسس العلمية للتخطيط السليم لأجل تحقيق الإكتفاء الذاتي.
10. التفاعلات في التواصل الإجتماعي وأثرها علي المجتمع السوداني المعاصر.
11. تأثير تقانة المعلومات وعلوم الحاسوب على المجتمع السوداني المعاصر.

**تفاصيل المقرر:**

1. تعريف موجز بتاريخ السودان مع التركيز على تتبع فكرة الدولة و الخريطة الزمنية لها، كما يتناول

تكوين حدود السودان الحالية والإتفاقات الدولية الخاصة بها والمشكلات الناجمة عن كبر حجم السودان وطول حدوده.

1. نشأة المجتمع السوداني والتنوع العرقي في السودان وبناء القومية السودانية )الهوية السودانية).

خصائص الشخصية السودانية ومكوناتها.

1. مكونات الثقافة السودانية: أثر الإسلام والعروبة والإفريقية والثقافات الأخري في الثقافات السودانية.
2. الدور الجغرافي والسياسي للسودان في المنطقة مع التركيز على القرن الأفريقي.
3. الإقتصاد السوداني منذ الإستقلال مع دارسة البرامج الإقتصادية المعاصرة.
4. التعليم في السودان.
5. مفهوم البيئة : عناصر البيئة، النظام البيئي، أنواع الأنظمة البيئية، إتزان النظام البيئي، السلسة الغذائية وتدفق الطاقة في النظام البيئي، الدورات البيوجيوكيميائية )الكربون، الأكسجين، النتروجين، الفسفور(.
6. العلاقة بين الإنسان والبيئة.
7. أهمية التخطيط السليم للمحافظة على البيئة.
8. الموارد الطبيعية: تعريفها، أنواعها ، إستغلالها، مفهوم المحافظة عليها، مفهوم إستنزافها والمخاطر المترتبة على ذلك.
9. التعريف بالتنمية ومفاهيمها.
10. التغذية والصحة
11. السياسات الواجب إتباعها لتحقيق الأمن الغذائي والإكتفاء الذاتي في السودان.

التقييم:

* درجة الإمتحان النهائي (75%).
* درجة أعمال السنة (25%).

**Course Title Course Code:** Lab Safety (MLS-SAF-129)

**Credit hours :** 2 Hours (2+0)

**Duration :** 15 weeks

**Disciplines involved :** All Disciplines of MLS

***Prerequisites:***

-------

***Course contents:***

The course discuss the role of Medical lab safety, the course is designed to provide the Student with Basics and Fundamentals in medical labs.

***Rationale:***

The concepts of handling and dealing with blood samples inside the laboratory have a great importance in medical laboratory sciences and are very hazardous. Thus, student should know the right way to deal with such samples in addition to legal requirements in order to protect him/her from dangerous and hazardous.

***Course out comes(Specific objectives):***

***By the end of the course students are expected to achieve the following Specific objective:***

1- Discuss the common laboratory hazards to include - Chemical, Fire, Biological, Mechanical and Electrical.

2- Describe the proper storage and handling of dangerous chemicals and reagents used in the lab.

3- Describe the proper procedure for handling accidents.

4- Identify the basic procedures followed in infection control.

5- Define the major types of laboratory hazards, giving example of each type.

6- Obtain a blood specimen including:

- Approaching the patient.

- using relevant Equipment.

- Selecting and preparing the puncture site.

- Performing the puncture.

- Listing precautions to be observed.

- Explaining the proper use of vacuum tube.

- Describing the common types of anticoagulants, how they work and when they be used.

- Performing a vein puncture by vacationer method and a finger puncture under the guidance of the instructor.

7- Explain methods of sterilization and demonstrate the proper method for handling and disposing of biological hazards.

8- Describe equipment available in the laboratory used for safety

9- Describe basic first aid procedures

10- Explain the appropriate local safety procedures.

11- Explain and practice laboratory specimen collection techniques:

a- Perform basic laboratory specimen collection techniques, including Phlebotomy.

b-Demonstrate protocols used in identification of specimens and the procedures used to maintain accurate patient identity.

c- Discuss complication encountered in specimen collection

d- Select an appropriate method of resolving problems of specimen collection.

e- Employ measures to maintain patient confidentiality.

***Educational Strategies and Methods:***

1. Lectures.
2. Tutorial.
3. Group work.
4. Seminars

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %
2. Final exam (Written Exam MCQs & structured questions : 70%

***Required Resources (in details):***

1. Lecture room.
2. Staff (Prof, Associate Prof. OR Assistant Prof).

***References:***

McClatchey, K.D., Alkan, S., Hackel, E., Keren, D.F. and Lew, K. (2001) Clinical laboratory medicine. [electronic resource]. 2nd edn. Philadelphia: Lippincott Williams & Wilkins,US.

Cheesbrough, M. (2006) District laboratory practice in tropical countries, part 2: Pt. 2. 2nd edn. Cambridge: Cambridge University Press.

Houang, L., El-Nageh, M., Organization, W.H. and El-Nageh, M.M. (1993) Principles of management of health laboratories. Alexandria, Egypt: World Health Organization, Regional Office for the Eastern Mediterranean.

Burtis, C.A., Ashwood, E.R. and Bruns, D.E. (2005) Tietz textbook of clinical chemistry and molecular diagnostics. 4th edn. United Kingdom: Saunders (W.B.) Co.

Organization, W.H. and Staff, W.H.O. (2005) Laboratory biosafety manual. 3rd edn. Geneva: World Health Organization

|  |
| --- |
| **Semester Three**  **Syllabus** |

**Course Title Course Code:** General Pathology (MLS-PTH-231)

**Credit hours :** 2 Hours (2+0)

**Duration :** 15 weeks

***Prerequisites:***

-------

***Course contents:***

This course enables the student to identify the basics of pathology such as: (1) cell injury, (2) inflammation, (3) disorders of haemostasis and (4) neoplasia and neoplasms.

***Course out comes:***

***By the end of the course, students are expected to achieve the following Specific objectives:***

1. Define cell injury.
2. List the different types of cell injury.
3. Discuss the causes of cell injury
4. Explain and discuss the mechanism of cell injury.
5. Define inflammation.
6. List the different types of inflammation.
7. Discuss the mechanism and causes of inflammation.
8. Discuss the outcomes of inflammation.
9. Define thrombosis and discuss it’ causes and outcomes.
10. Define embolism and discuss its causes and outcomes.
11. List the different types of embolism.
12. Define infarction, explain its causes and list its types.
13. Define neoplasia.
14. Name the different types of neoplasms.
15. Discuss the different causes of neoplasia.
16. Define fine needle aspiration and its uses.

***Educational Strategies and Methods:***

1. Lectures.
2. Tutorial.
3. Group work.
4. Seminars

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %
2. Final exam (written MSQs+ structured questions) 70 %

***Required Resources (in details):***

1. Lecture room with multimedia.
2. Staff (Prof, Associate Prof. OR Assistant Prof).

***References:***

Pathology Manual, World Medical Association, 2nd edition2009

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

**Course Title Course Code:** Basic Immunology (MLS-IMM-232)

**Credit hours :** 2 Hours (2+0)

**Duration :** 15 weeks

***Prerequisites:***

-------

***Course contents:***

This course presents detailed description of the structure of the immune system and its tissues and its cellular properties and function and the chemical element of the immune system especially cytokines. The course also includes defining innate and acquired immunity and its types and the different mechanism of immune response, hypersensitivity and its types, mechanisms and diagnosis. The course also gives detailed explanation of immunity against microbial insult and methods of prophylaxis, serological and immunological diagnosis of microbial infection, immunodeficiency diseases and its diagnosis and the mechanism of vaccine and toxoid action and the way of their preparation and utilization for prophylaxis and treatment. Students are also trained to use laboratory equipment related to immunological and biocellular diagnosis as ELIZA and PCR.

***Course out comes:***

***By the end of the course, students are expected to achieve the following Specific objectives:***

1. Discuss the concept of innate immunity - features, importance.
2. Explain how the innate immune system recognizes foreign antigens in general.
3. Outline the components of the innate immune system.
4. Categorize the specific chemical and mechanical barriers in the body
5. Discuss how these components combat various foreign antigens
6. Define phagocytosis, and list two types of phagocytic cells derived from white blood cells.
7. Describe the function of complement.
8. Describe the stage of inflammation.
9. Explain the evolutionary forces behind adaptive immunity
10. Introduce the concept and significance of self/non-self discrimination
11. Outline the immune cells that mediate adaptive immunity and their specific roles in immune response to varying pathogens/antigens
12. Discuss the differences between cell-mediate immunity and humoral immunity
13. Explain what interactions are required for activation of T and B cells
14. Describe antigens and antibodies, contrast their roles
15. Describe the 5 classes of antibodies with examples of the functions of each.
16. Discuss immunological memory and outline the differences between primary and secondary (memory) responses
17. Compare and contrast the innate and adaptive immune response
18. Provide an overview of CMI.
19. Discuss key CMI reactions.
20. Review regulation of CMI.
21. Discuss viral counterstrikes against CMI
22. Define "antigen" and "antibodies".
23. Draw a generalized diagram of an antibody molecule.
24. List five immunoglobulin classes and the function of each one.
25. Define "antigen presentation".
26. Define "major histocompatibility complex".
27. Describe the role of cytokinesand the role of them in immune responses .
28. Distinguish among neutralization, agglutination, and precipitation.

***Educational Strategies and Methods:***

1. Lectures.
2. Tutorial.
3. Group work.
4. Seminars

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %
2. Final exam (Written Exam MCQs & structured questions : 70%

***Required Resources (in details):***

1. Lecture room with multimedia.
2. Staff (Prof, Associate Prof. OR Assistant Prof).

***References:***

Murray, P.R., Rosenthal, K.S. and Pfaller, M.A. (2015) Medical microbiology. Philadelphia, PA, United States: Elsevier Science Publishing Co.

Abbas, A.K. and Lichtman, A.H. (2006) Basic immunology: Functions and disorders of the immune system: 2006-2007. 2nd edn. Philadelphia, PA: Elsevier, Saunders.

Delves, P.J., Martin, S.J. and Burton, D.R. (2011) Roitt’s essential immunology: Includes free desktop edition. 12th edn. United Kingdom: Wiley-Blackwell (an imprint of John Wiley & Sons Ltd).

Blaney, K.D. and Howard, P.R. (2012) Basic & applied concepts of blood banking and transfusion practices. Philadelphia, PA, United States: Mosby.

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

## Course Title and NO : Chemical Pathology 1 MLS-CHE-233

## Course duration : 15 weeks

## Credit hour : 3 hours

## Intended students : Semester 3

## Prerequisite : lab safety, mathematics, scientific English, Biochemistry and Physiology of human body.

**Introduction & Rationale:**

* Clinical chemistry is that discipline which applies basic biochemistry and analytical chemistry to medical diagnosis, treatment and management. It provides a sound, objective basis on which to gauge the extent of a clinical disorder, the biochemical consequences of a particular disease process and the response to therapy.

**General objectives:**

1. Understand the bases of clinical chemistry, human biochemistry and biochemical laboratory hazards.
2. Define units of measurement.
3. Give an account on clinical chemistry laboratory supply and instrumentation.
4. Outline the general steps in specimen collection.
5. List the tests in a urinalysis and microscopy profile and

Understand the clinical significance of each.

**Specific objectives**:

1. Recognize basic clinical chemistry and identify role in medicine.
2. Identify the hazards in clinical chemistry lab and state the Biosafety and precaution.
3. Outlines types and use of glassware and plastic ware that use in clinical chemistry lab.
4. List basic clinical chemistry laboratory instruments.
5. Describe procedures and protocols of collection, storage and transport of specimens in chemical pathology lab.
6. Give an account on the different types of anticoagulants used in clinical chemistry lab.
7. Define units of measurement and relate the differences among various units.
8. Demonstrate and preparation of solutions from solid substances and from stock solutions.
9. Identify and perform the methods of concentration expression (morality, normality and percentage)
10. Define the buffer and PH and identify measurement of PH.
11. Differentiate between the qualitative and quantitative tests.
12. Explain renal anatomy and physiology.
13. Describe urine formation and normal components of urine
14. Apply physical, chemical and microscopical examination of urine
15. State parts of colorimeter and spectrophotometer and define Beer's and Lambert's low.
16. Describe the various calibration procedures that use in clinical chemistry Laboratory.

Course outline:

1. Introduction to clinical chemistry.
2. Lab safety in clinical chemistry
3. Clinical chemistry laboratory supplies and Instrumentation.
4. Specimen collection and consideration in clinical chemistry laboratory.
5. Units of measure and reagents preparation Clinical chemistry laboratory.
6. Clinical chemistry laboratory mathematics and calculation.
7. Calculation of acid-base in clinical chemistry laboratory.
8. Renal anatomy and physiology.
9. Physical Examination of urine.
10. Chemical examination of urine.
11. Microscopical examination of urine.
12. calorimeter and spectrophotometer.
13. Calibration Procedures in clinical chemistry Laboratory.
14. Revision

**Methods of student’s assessment**:

* **Course evaluation:**

1. Mid semester examinations run by internal examiners as well as final examinations. (20%).
2. Evaluation consists of 2 computerize exam (100%).

Practical (2 practical examination) (100%).

Methodology:-

The methods of instruction are:-

1. Lectures.
2. Practical.
3. Seminars and tutorials.

References:

1. Carl A. Burtis, Edward R. Ashwood, Tietz Fundamentals of Clincal Chemistry W.B. Saunders, 2001.

2. Michael L.Bishop Clinical Chemistry: Principles, Procedures and Correlations, fifth edition, 2005

3. Alan H. Gowenlock, Janet R. Mc Murray, Varrley’s practical clinical biochemtry, sixth edition, 2001

Title of the course: Basic hematology MLS-HEM-234

Intended Semester: Semester3

Course duration: 15 Weeks

Study hours per week

Lecture: 2 hours

Practical: 2 hours

Credit hours: 3 (2+1)

Rational

This course is intended for medical laboratory science students.

General objectives

By the end of this course, the medical laboratory students should be oriented in the hematology laboratory, and able to understand physiological principles of the production, constituents, morphology and function of blood. Moreover, he should also be able to perform the basic hematological techniques as a first step in the diagnosis of blood diseases.

**Specific objectives**

Upon the completion of the course the students should be able to:

1. Recognize constituents and physical properties of blood plus safety in the hematology laboratory
2. Describe blood cells development, function and morphology
3. Recognize the structure and function of red blood cells membrane and the red cells metabolism
4. Describe the structure, types, synthesis, break down and estimation of hemoglobin
5. Recognize the use of anticoagulants and collection of specimens
6. Prepare the solutions and stains that used in hematology laboratory
7. Count the different types of blood cells and estimate hemoglobin concentration in the blood samples
8. Measure P.C.V, calculate the absolute values and perform E.S.R.

Instructional methods

1. Lectures
2. Laboratory Practical
3. Tutorials

Evaluations

Final examinations run by internal examiners

Evaluation consists of:-

1. M.C.Q: 10 %
2. Long essays: 20%
3. Short questions: 20%
4. Practical: 40%
5. Oral : 10%

Course description

Lectures

Week (1): Introduction to hematology

* Definition, classification and functions
* Constituents and physical properties of blood

Week (2): Safety in hematology laboratory

* Universal precautions
* Occupational hazards

Week (3): Origin development of hemopoietic tissues

* Sites and structures
* Activities

Week (4): Red blood cell production: "Erythropoiesis"

* Definition and promotion
* Regulation and substances needed

Week (5): Blood collection, storage and transport

* Phlebotomy and anticoagulants
* Storage and transport

Week (6): Basic hematological techniques: Hemocytometry

* Principle and calculation
* Significance and source of errors

Week (7): Red blood cell count

* Principle and reagent
* Procedures and interpretation of results

Week (8): Hemoglobin

* Types and structures
* Synthesis and break down

Week (9): Hemoglobin estimation

* Principle and techniques
* Comparison and source of errors

Week (10): Cyanomethemoglobin method

* Principle and reagents
* Procedures and calculation

Week (11): Hemoglobin chart and curve

* Chart
* Curve

Week (12): Basic techniques

* Packed cell volume
* Absolute values

Week (13): Erythrocyte sedimentation rate

* Principle and methods
* Techniques and source of errors

Week (14): White cell production "Leucopoiesis"

* Definition and promotion
* Regulation and substances needed

Week (15): White blood cell count

* Principle and reagent
* Procedures and interpretation of results

Practical

Week (1): Introduction "Laboratory safety, precautions and restrictions"

Week (2): Hematology laboratory environment, equipment, apparatuses and basic operations

Week (3): Preparation of solutions and stains and units of measurement

Week (4): Differentiation of hemopoietic cells: Red blood cell normal morphology

Week (5): Blood sample collection and anticoagulants

Week (6): Haemocytometry

Week (7): Red blood cell count 1

Week (8): Red blood cell count 2

Week (9): hemoglobin estimation "cyanomethaemoglobin method"

Week (10): Hemoglobin curve and chart

Week (11): Packed cell volume

Week (12): Calculation of absolute values

Week (13): Erythrocyte sedimentation rate

Week (14): White blood cell count

Week (15): Eosinophil count

Code of the course: MLS-PRO-237

Course title: Protozology 1

Intended Semester: Semester 3

Course duration: 15 weeks

Credit hours: 3 hours

Theory 2 hrs

Practical 2hrs

Rationale

This course is intended for medical laboratory science students.

**Generalobjectives**

By the end of this course medical laboratory science student should be able to:

1. Understand the role of protozoa in causation of diseases in man.
2. Understand the relationship between environment and transmission of protozoa.
3. Practice basic laboratory skills that are used in the technology of the diagnosis of parasites and parasitic infections.

**Specific objectives**

By the end of this course, candidates should be able to:

1. Demonstrate adequate knowledge and understanding the scope of medical parasitology, together with the basic terminology and definitions as well as the nomenclature of protozoa.
2. Identify and understand the biology and taxonomy of protozoa.
3. Practice the basic skills and techniques for stool examination.
4. Demonstrate adequate knowledge about the characteristic and diagnostic features of different intestinal protozoa.
5. Demonstrate adequate knowledge and understanding the biology and epidemiology of Leishmania parasite as well as practice the basic techniques applied in the diagnosis of Leishmaniasis.
6. Demonstrate adequate knowledge about the biology and epidemiology of Trypanosoma parasite as well as to practice the basic techniques applied in the diagnosis of different types of trypanosomiasis.

**Instructional methods**

1. Lectures
2. Laboratory practice
3. Tutorials
4. Seminars

Evaluation

Written and practical examinations held at the end of the two terms (3-4) by internal examiners.

1. Written exam: 40 %
2. Practical exam 50%

Assignments, log books, attendance, etc.. 10%.

### Course content

### Theory Lecture

Week (1): General introduction, definitions of terminology

Week (2): Taxonomy of protozoa

Week (3): Quality control of stool examination

Week (4): Entamoeba histolytica

Week (5): Entamoeba coli and other intestinal amoeba

Week (6): Free living amoebae

Week (7): Giardia lamblia

Week (8): Other flagellates

Week (9): Intestinal parasites (Seminar)

Week (10) LeishmaniaI (coetaneous Leishmaniasis)

Week (11) Leishmania II (Visceral Leishmaniasis)

Week (12) Leishmaniasis in Sudan (Seminar)

Week (13) Trypanosoma I (African Trypanosomiasis)

Week (14) Trypanosoma II (American Trypanosomiasis)

Week (15) Class test

#### Practical

Week 1 Orientation

Week 2 Microscopy

Week 3 Stool examination

# Week 4 Entamoeba histolytica and allies (all stages)

# Week 5 Entamoeba coli and other intestinal amoeba (all stages)

# Week 6 Free living amoebae (all stages)

# Week 7 Giardia lamblia (all stages, lab. Diagnosis of Giardiasis)

Week 8 Other flagellates – *Trichomonas vaginalis*

Week 9 INTESTINAL PARASITES – seminar

Week 10 *Leishmania* I (coetaneous Leishmaniasis) – all spp.

# Week 11 Leishmania II (Visceral Leishmaniasis) – all spp.

# Week 12 Leishmaniasis in Sudan (seminar)

# Week 13 Trypanosoma I (African Trypanosomiasis) all spp.

Week 14 *Trypanosoma* II (American Trypanosomiasis) all spp.

Week 15 Class test

Code of the course: MLS-HIS-236

Title: Basic Histopathology 1

Intended Semester: Semester 3

Course duration: 15 weeks

Lectures: 2 hrs per week - duration 15 wks

Practical: 2 hrs per week - duration 15 wks

**General Objective**

By the end of this course, medical laboratory students should be able to: -

1. Know the general aspects and general principles of the pre-analytic phase for histopathology laboratory methods.
2. Perform the initial processes intended to ensure the quality of the histopathological techniques.

**Specific Objectives**

By the end of this course, medical laboratory students should be able to:-

1. Specify laboratory safety, equipments and apparatuses in histopathology, as well as preparation of solutions and reagents.
2. Identify the general aspects of collection, storage, transport and type of samples related to histopathology.
3. Identify the general principle for preparing for histopathological examination, fixation and decalcification of bones

**Instructional methods**

1. Lectures
2. Laboratory practice
3. Tutorials
4. Seminars

**Evaluation**

Written and practical examinations held at the end of the two terms (3-4) by internal examiners.

1. Written exam: 40 %
2. Practical exam 50%

Assignments, log books, attendance, etc.. 10%.

Lectures

Week (1) Introduction.

Week (2) Methods of preparation and examination.

Week (3) Non- Staining method.

Week (4) Fixation: Introduction.

Week (5) Simple fixatives 1.

Week (6) Simple fixatives 2.

Week (7) Micro anatomical fixatives 1.

Week (8) Micro anatomical fixatives 2.

Week (9) Cytological fixatives.

Week (10) Histochemical fixatives.

Week (11) Tutorial.

Week (12) Decalcification of bone 1.

Week (13) Decalcification of bone 2.

Week (14) Preparation of un decalcified bone.

Week (15) Revision.

### Practical

Week (1) Introductory lab about Histopathology and cytology.

Week (2) Imaging the Histopathology lab.

Week (3) Methods of preparation

Week (4) Tutorial: Methods of sample preparation -Normal Histology

Week (5) GIT system

Week (6) Tongue

Week (7) Esophagus

Week (8) Stomach

Week (9) Small intestine

Week (10) Large intestine

Week (11) Preparation of fixatives

Week (12) End point of decalcification

Week (13) Revision: Normal histology

Week (14-15) Tutoria

**Course title:** ***Basic microbiology***

**Course symbols and numbers**: ***(MLS -MIC-235)***

**Duration & credits** 15weeks (3chs)

***Outline***

This is a four week-block module that covers the ways of collection specimens for clinical microbiology investigation and selecting the growth media and basics components and assuring vaccination and sterilization for microbial decontamination and the necessary precautions to be followed in dealing with biologically hazardous sources in microbiological laboratories and the selection of proper specimens for anaerobic culture. The details include : proper steps for sampling, handling and investigation, differentiation between suitable and unsuitable ,samples the growth media and how to identify them , sterilization techniques ,decontamination ,the precautions for dealing with biological hazards , proper samples for anaerobic culturing ,the basics methods for recognizing gram negative and gram positive and the means of getting pure growths from mixed growth culture media .

The module also defines the terms sterilization, disinfection and antiseptics and details the methods used in sterilization (heat, ionizing radiation, filtration, gaseous chemical agents, liquid chemical agents …etc), measurement of microbial death, resistance to sterilization and disinfection and equipments used. The graduate technologist should know the appropriate methods for sterilization of various types of material and instrument.

***Rationale***

Clinical microbiology is amongst the most widely studied and followed branches due to its great importance to medicine. Along with providing a deep knowledge and understanding of the nature of pathogens this line of study has also been applied in several immunological innovations in the field of medical science. The field of medical microbiology is engaged with identifying new microorganisms, monitoring changes in rapidly mutating species, and dealing with ongoing challenges in microbiology.

Microbiology laboratories are the first line of defense for detection of new antibiotic resistance, outbreaks of food borne infection. Maintaining high-quality clinical microbiology laboratories on the site of the institution that they serve is the current best approach for managing today's problems of emerging infectious diseases and antimicrobial agent resistance by providing good patient care outcomes that actually save money **.**

***General* objectives**

***By the end of this course the student is expected to***:

1. Name and discuss diseases caused by pathogenic microorganisms
2. Discuss general methods used in the identification of gram positive bacteria.
3. Understand of the critical components of a good laboratory safety program
4. Know the appropriate methods for sterilization of various types of materials and instruments.

**Specific objectives:**

***B***y the end of this block the student should be able to:

1. List the major groups of organisms studied in microbiology. .
2. Define autotrophs, heterotrophs, saprophytes, and chemoautotrophs.
3. Compare and contrast the various oxygen requirements of bacteria and given data interpret the whether a bacteria is aerobic, facultative anaerobic, anaerobic or microaerophilic.
4. Characterize Psychrophiles, Mesophiles and Thermophile
5. Describe cultural morphology using microbial terminology.
6. Analyze a typical bacterial growth curve and relate its significance to the generation time of of a species and the progression of  disease in the host.
7. Discuss general methods used in the identification of microorganisms.
8. Describe the common anatomical structures found in bacteria and explain their function.
9. **[**flagella, pili, glycocalyx, capsule, endospores, cytoplasm or cytosol, ribosomes, inclusions, chromosome, plasmids, cell membrane, and cell wall].
10. Recognize and name by sight, the most common bacterial morphological shapes [cocci, bacilli, spirilla-spirochetes, coccobacilli, pleomorphic].
11. Identify and name the common bacterial arrangements giving examples of organisms displaying the arrangement [single, diplo.., staphylo.., strepto.., sarcina, tetrad].
12. Differentiate between the main components and resulting characteristics attributed to bacteria displaying Gram negative and Gram positive cell walls.
13. Correctly prepare a Gram stain and using the microscope identify the Gram reaction, cell shape, and cell arrangement
14. Describe the bacterial genome, and explain how it replicates, and how it differs from eukaryotic genomes.
15. Describe the role of plasmids and contrast them with the bacterial chromosome.
16. Compare and contrast microbiological media used in the isolation and identification of bacteria and fungus, parasites and viruses**.**
17. Describe the general principles of stain technology.
18. define “culture media,” and describe the purpose for which such media are used
19. discuss aseptic techniques
20. Discuss, perform and interpret biochemical tests used in the identification of bacteria and fungus.
21. Identify bacteria based on microscopic and macroscopic morphology, media growth and biochemical testing.
22. Discuss modes of action and mechanisms of resistance of antimicrobial agents.
23. Compare and contrast methods used to determine bacterial susceptibility or resistance to antibiotics.
24. Identify the methods used for laboratory diagnosis of gram positive bacteria (staphylococcus ,streptococcus,listeria ,corenybaterium and cholestridum )
25. Demonstrate awareness of good design, management and laboratory practices
26. Recognize the process of assessing and reducing the risks within laboratories .
27. Identify the potential health and physical hazards of the chemicals and equipment used in the laboratory;
28. Explain proper and safe procedures for handling, under all circumstances, the hazardous substances used in the laboratory;
29. Use personal protective equipment properly .
30. Interpret hazardous chemical labels and Material Safety Data Sheets.
31. Recognize the importance of being able to read a Material Safety Data Sheet (MSDS), recognize chemical labeling and know how to store chemicals correctly.
32. Perform basic actions to take in emergency situations, including the use of safety showers and eye washes
33. Demonstrate how to work safely with radiation and radioactive materials
34. List items that should be discarded as regulated medical waste.
35. Identify [basic principles of infection control](http://www.linlochead.com/course/course-1-certification-sterilization-infection-control.php) and [sterilisation techniques](http://www.linlochead.com/course/course-1-certification-sterilization-infection-control.php), [sterilization methods](http://www.linlochead.com/course/course-1-certification-sterilization-infection-control.php) needed to conform to sterilising standards and [sterilisation guidelines](http://www.linlochead.com/online-infection-control-policies-precedures.php).
36. Differentiate between sterilization and disinfection .
37. Describe potentially hazardous biological materials, the risks associated with their use, and the means to minimize risk and to protect against or prevent release or exposure

## *Education strategies and methods* :

Power point slide

Laboratory practice

Assignments

***Evaluation & assessments methods :***

Mid course exam ……………………………. 10%

Final theory exam …………………………….40%

Final practical exam…………………………..30%

Spot exam …………………………………..1o%

Assignments ………………………………….5%

Attendance …………………………………… 5%

***References :***

District Laboratory practical. In Tropical Countries cheesbrogh , 1 & 2, 978 – 0521676328,978 -0521676311

microbiology, Green world + Patherer + Barer, chwchil 978 – 0443102103

White, Medical virology, Academic Press, 978 – 0127466422

Diagnostics microbiology

Handout from power points slide .

|  |
| --- |
| **Semester Four**  **Syllabus** |

**Course Title Course Code:** Molecular Biology (MLS-MOL-241)

**Credit hours :** 2 Hours

**Duration :** 15 weeks

***Prerequisites:***

Biochemistry.

***Rationale:***

Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It is a large and ever-changing discipline. This course will emphasize the molecular mechanisms of DNA replication, repair, transcription, splicing, protein synthesis, and gene regulation in different organisms. We will study the techniques and experiments used to discern these mechanisms, often referring to the original scientific literature. In addition, we will take an in-depth look at some rapidly evolving fields, including chromatin structure and function, genome editing techniques, back splicing, and regulation of gene expression by different types of RNAs.

***Course contents:***

The course investigates : Tools of molecular biology, Structure of Nucleic acids and proteins, DNA-Protein interactions, Transcription in Eukaryotes, Post transcriptional events, Transcriptional regulation, Translation and translational regulation, post translational modification, RNA and Protein export and its regulation. DNA Replication and enzymology, DNA damage and repair. Noncoding RNA, transposons. Introduction to Genomics, Proteomics, Metabolomics. Evidence for DNA as genetic material. Gene transfer in microorganisms – conjugation, transformation, and transduction - protoplasmic fusion. The genomes of bacteria, viruses, plasmids. Introduction to the methods of DNA sequencing.

***Course out comes:***

***By the end of the course, students are expected to achieve the following specific objectives:***

1. Explain and give examples of how ionic, hydrophobic, and hydrogen bonding interactions determine the structure of nucleic acids and proteins and modulate the specificity of binding between them.
2. Distinguish between different molecular biology techniques that are used to isolate, separate, and probe for specific proteins, nucleic acids, and their interactions. Identify limitations of these techniques.
3. Given a particular biological question, identify which experimental techniques are best used to answer that question.
4. Compare and contrast the mechanisms of bacterial and eukaryotic DNA replication, DNA repair, transcription, and translation.
5. Explain how DNA topology and chromatin structure affects the processes of DNA replication, repair, and transcription.
6. Give examples of DNA and histone modifications and predict how they will affect gene expression.
7. Describe mechanisms by which DNA can be damaged and describe the molecular mechanisms by which protein complexes repair different forms of DNA damage.
8. Provide examples of how homologous recombination is used to ensure genome stability and promote genetic diversity.
9. Interpret and critique data from primary research articles.
10. Write a perspective about a primary research article.
11. Recognize the cell organelles and their functions
12. Identify differences between prokaryotics and eukaryotics cells.
13. Explain cell cycle steps and events
14. Explain the DNA structure, function and replication
15. Explain the RNA structure, function, transcription and reverse transcription
16. Explain the genetic code
17. Explain protein synthesis
18. Explain gene expression and cell signaling
19. Identify and explain different types of mutations
20. Explain mendelian lows
21. Explain chromosomal cell structure and function
22. Explain chromosomal abnormalities
23. Explain PCR technique
24. Outline extracts DNA, RNA and Protein
25. Explain Restriction Fragments Lengths Polymorphism (RFLP), gel electrophoresis and different DNA analysis tools.
26. Outline G-mapping of human chromosomes

***Educational Strategies and Methods:***

1. Lectures.
2. Tutorial.
3. Group work.
4. Seminars

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %
2. Final exam (written (MCQs & structured questions + practical) 70 %.

***Required Resources (in details):***

1. Lecture room with multimedia.
2. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Turner, P.C., Turner, Turner, M. and Bates, W. (2000) Instant notes in molecular biology. 2nd edn. New York: Garland Publishing.

Sambrook, J., Sambrook, J., Fritsch, E.F. and Maniatis, T. (1987) Molecular cloning: A laboratory manual. 2nd edn. United States: Cold Spring Harbor Laboratory Press,U.S.

Starr, C., Taggart, R. and Taggart, L. (2005) Cell biology and genetics (with 1pass for BiologyNow, vMentor, how do I prepare, iLrn, and InfoTrac), Vol. 1. 11th edn. United States: Thomson/Brooks Cole.

Lodish, H., Darnell, J.E., Berk, A., Matsudaira, P., Kaiser, C.A. and Krieger, M. (2003) Molecular cell biology. 6th edn. New York: Freeman, W. H. & Company.

Watson, J.D., Laboratory, C.S.H., Baker, T.A., Technology, M.I. of, Bell, S.P., Gann, A., Levine, M., Berkeley, Losik, R. and Gann, er (2013) Molecular biology of the gene, 7/e. 7th edn. Boston: Benjamin-Cummings Publishing Company, Subs of Addison Wesley Longman.

Freifelder, D. and Freifelder, F. (1983) Molecular biology: A comprehensive introduction to prokaryotes and eukaryotes. Boston: Jones and Bartlett Publishers.

Alberts, B., Johnson, A. and Lewis, J. (2014) Molecular biology of the cell. United States: Palgrave Macmillan.

Burkowski, F.J. and Staff, B.F.J. (2008) Structural bioinformatics: An algorithmic approach. Boca Raton, FL: Chapman & Hall/CRC.

**Code of the course:** MLS-CHM-242

**Title**: Chemical pathology -2.

**Intend Semester**: Semester 4

**Course duration**: (15) weeks

**Lectures:** 2 hours per week

**Practical:** 2 hours per week

**General objectives**

By the end of this course, medical laboratory students should be able to:-

1. Understand the chemical background of renal diseases
2. Understand the chemical aspects of liver diseases

**Specific objectives**

By the end of this course the students should be able to:-

1. Describe the bases of liver anatomy and physiology
2. Describe the physiology and anatomy of renal system and properties of renal diseases
3. Identify the synthesis, functions, metabolism and laboratory measurement of plasma proteins
4. Describe metabolism and disorders of carbohydrates and bilirubin synthesis
5. Perform urine analysis

**Instructional methods**

1. Lectures
2. Practical
3. Tutorials
4. Seminars

**Evaluations**

Final examinations by internal examiners, the evaluation consist of:

1. M.C.Q 10 %
2. Long essays 20%
3. Short questions 20%
4. Practical 40%
5. Assignments, tests, others 10%

**Course content**

**Lectures**

**Week (1)** Renal diseases

* Nephrotic syndrome
* Renal failure

**Week (2)**

* Urinalysis-1: Physical & chemical examinations

**Week (3)**

Urinalysis-2: Deposits & microscopically

**Week (4)**

Urinalysis-3: Significance & Diagnostic values

**Week (5)** Plasma proteins-1

* Classification & synthesis
* Metabolism & Function

**Week (6)**

Plasma protein-2: Disorders & Method of separation

**Week (7)**

Plasma protein-3: Albumin, Globulins and fibrinogen

**Week (8)**

Method of protein estimation: Chemical & Refractometry

**Week (9)**

Liver-1: Anatomy & physiology.

**Week (10)**

Liver-2: Pathophysiology

**Week (11)**

Tutorial

**Week (12)**

Bilirubin: Synthesis & Metabolism

**Week (13)**

Carbohydrates: Metabolism & disorders.

**Week (14)**

Reducing substances and ketone bodies: Synthesis & Significance

**Week (15)**

Assessment

Practical

**Week (1)**

Urinalysis (physical examination).

**Week (2)**

Urinalysis (physical examination).

**Week (3)**

* Urinalysis (Qualitative test).

**Week (4)**

* Urinalysis (Microscopical examination).

**Week (5)**

* Total protein estimation.

**Week (6)**

* Total protein estimation (Comparison refractometery& chemical).

**Week (7)**

* Estimation of albumin.

**Week (8)**

* Total bilirubin.

**Week (9)**

* Direct bilirubin.

**Week (10)**

* Tutorial.

**Week (11)**

* Reducing substances.

**Week (12)**

* Glucose estimation.

**Week (13)**

* Preparation and usage of STD solutions.

**Week (14)**

* Common mistakes in clinical chemistry laboratory.

**Week (15)**

* Assessment.

**Code of the course:** MLS-HIS-246

**Title of the course: Basic** Histopathology 2

**Intended Semester:** Semester 4

**Course duration:** 15 weeks

**Lectures:** 2 hrs per week

**Practical:** 2 hrs per week

**Credit hours:** 3 hrs (2+1)

**General objectives**

By the end of this course, medical laboratory students should be able to:

1. Know the methods of processing and staining.
2. Know the theory of staining

**Specific objectives:**

1. Perform the methods of processing and embedding of tissue.
2. Perform and identify principles of staining of tissue.

**Instructional methods**

1. Lectures
2. Laboratory practice
3. Tutorials
4. Seminars

**Evaluation**

Written and practical examinations held at the end of the two terms (4-5) by internal examiners.

1. written exam: 40 %
2. practical exam 50%
3. Assignments, log books, attendance, etc..10%

**Course content**

**Lectures**

**Week (1)** Introduction

**Week (2)** Embedding media 1

**Week (3)** Embedding media 2.

**Week (4)** Embedding media3.

**Week (5)** Tissue processing.

**Week (6)** Dehydrating fluid and clearing agents.

**Week (7)** Manual and automatic tissue processing 1.

**Week (8)** Manual and automatic tissue processing 2.

**Week (9)** Storage.

**Week (10)** Microtome.

**Week (11)** Theory of stain 1.

**Week (12)** Theory of stain 2.

**Week (13)** H & E.

**Week (14)** Routine stain.

**Week (15)** Mounting media.

**Practical**

**Week (1)** Liver

**Week (2)** Spleen

**Week (3)** Kidney

**Week (4)** Tissue processing

**Week (5)** Embedding media

**Week (6)** Microtomy

**Week (7)** Skin

**Week (8)** Lymph node.

**Week (9)** Revision: normal histology

**Week (10)** Test of normal histology

**Week (11)** Stain: H&E Mayer’s haematoxylin

**Week (12)** Stain: H &E Harris’s haematoxylin

**Week (13)** Stain with Weigert haematoxylin

**Week (14)** Stain with Erlich’s haematoxylin

**Week (15)** Revision

**Code of the course:** MLS-BAC-355

**Course Title:** Basic Bacteriology

**Intended semester:** Semester 5

**Course duration**: 15 weeks

**Lectures**: 2 hrs/ week.

**Practical:** 2 hrs/ week.

**Credit hours:** 4 (2+2)

**Instructional methods:**

1. Lectures
2. Laboratory practical
3. Tutorials

**Evaluation:**

Final examination runs by internal examiners.

**Evaluation consists of:**

1. MCQs
2. Case study
3. Short questions
4. Practical
5. Activities

**GENERAL OBJECTIVE :**

By the end of this course, medical laboratory students should be able to:

1. Know the general properties of pathogenic bacteria, and their role in the
2. Explain causation of disease.
3. Perform the laboratory methods used for of isolations,
4. Identify, of bacterial infections.

**SPECIFIC OBJECTIVES:**

1. Identify the properties, pathogenecity, and infections caused by Clostridia, Corynebacteria, and Bacillus species & able to perform the diagnosis of these bacteria.
2. Identify & perform the laboratory diagnosis, transmission, and prevention of bacterial infection caused by Listeria, Enterobacteria, Campylobacter, Pseudomonas, & Vibrio.

###### Course contents:

###### Lectures:

**Week (1)** Bacillus

**Week (2)** Corynebacteria

**Week (3)** Clostridia

**Week (4)** Listeria and Erysipelothrix

**Week (5)** Classification of gram negative rods

**Week (6)** Escherichia coli

**Week (7)** Salmonella

**Week (8)** Shigella

**Week (9)** Proteus and Morganella,

**Week (10)** Providencia and Serratia

**Week (11)** Klebsiella, Citrobacter and Enterobacter

**Week (12)** Campylobacters species and Helicobacter pylori

**Week (13)** Pseudomonas and Alcaligenes

**Week (14)** Vibrios.

**Week (15)** Tutorial

**Practical:**

**Week (1)** Bacillus

**Week (2)** Corynebacterium

**Week (3)** Clostridia

**Week (4)** Listeria and Erysipelothrix

**Week (5)** Biochemical of gram negative rods

**Week (6)** Escherichia coli

**Week (7)** Salmonella and laboratory diagnosis of enteric fever.

**Week (8)** Shigella

**Week (9)** Proteus and Morganella,

**Week (10)** Providencia and Serratia

**Week (11)** Klebsiella, Citrobacter and Enterobacter

**Week (12)** Campylobacters species and Helicobacter pylori

**Week (13)** Pseudomonas and Alcaligenes

**Week (14)** Vibrios.

**Week (15)** Revision

**References:**

1. **Brook, G. F.; Butel, J.; Ornston, L.; Jawetz, E.; Melnick, J.; Adelberg, E.** **(2007).** Medical Microbiology 20th edition. Appleton and long. California
2. **Collee, J. G.; Marmion, B. P.; Fraser, A. G.; Simmons, A.** (1996). Mackie and MacCarteny Practical Medical Microbiology 14th edition. Churchill Livingston New York**.**
3. **Mims, C.; Dockrell, H. M.; Goering, R.V.; Roitt, I.; Wakelin, D.; Zuckerman, M. (2004)** Medical Microbiology Elsevier Mosby updated 3rd edition
4. **Cheesbrough, M. (2004)** Medical Laboratory Manual for tropical countries volum.2. Microbiology**. 1962** Cambridge University Press.

**Green wood, D.; Slack, R.; and peutherer, J. (1992).** Medical microbiology. 14thedition. London: Churchill living stone

**Course title**: Serology and immunohematology

**Course symbols and numbers**: MLS -SER-243

**Duration and credits**: 15 weeks -3CHS

**Prerequisites**: Basic immunology

## Outline

On which the students are introduced to clinical immunology and its related serological investigations.

## Rationale

Due to the huge progression in the fields of immunology and introduction of advance investigations this course is important to MLS student. This course is placed after the course of the basic immunology in order to help the students to integrate between basic and clinical immunology. This course also provides the students with the needed and optimal information required for laboratory scientist to relate the diagnostic tests to the specific immunological disorders.

## General objectives:

The general objectives of this course are to:

1. Understand the application of immunological techniques

2. Acquire skills enable students to perform routine serological tests for specific disease entity.

## Specific objectives

By the end of this course the second year medical laboratory technology student is expected to:

* Describe the relationship between ABO antigen and antibodies for blood types O, A, B, AB.
* Identify the frequencies of four major blood group types of population.
* Explain the formation of H, A and B antigens on the red cells from precursor substances.
* Interpret the results from an ABO typing and resolve any discrepancies if present.
* Explain the derivation of the term Rh.
* Compare and contrast the fisher-race and wiener theories of Rh inheritance.
* Describe and differentiate the mechanism that result in weak-D expression in red cells.
* Define the characteristic of Rh antibodies.
* Describe the symptoms associated with Rh hemolytic transfusion reaction and HDN.
* State the principle of antiglobulin test.
* Compare and contrast the IAT and DAT.
* Include an explanation of principle, application, and red cell sensitization.
* Interpret the results of antiglobulin test.
* List the factors that affect antiglobulin test.
* List the source of errors associated with the performance of antiglobulin test.
* Recognize appropriate methods for proper patient identification in sample collection.
* Outline the procedure for testing of donor and patient specimens.
* Select appropriate donor units based on presence or absence of unexpected antibodies in the patient.
* Compare and contrast crossmatch procedures.
* Resolve incompatibilities in the crossmatch.

## Educational strategies:

1-Lectures: power point presentations of the main topics.

2-Practicals: Practicals in all basic serological techniques.

## Evaluation and assessment methods:

Attendance 5%

Assignment 5 %

Final exam 90 %

## Required resources:

Staff members: 6 (scientists)

Lecture room: For 80 students

Laboratory: For 80 students

**References:**

Abbas basic immunology, Saunders 978-1416029748

Immunology , Male+Brostott+Roth+Roitt-978-0808923329

**Course Title**: Medical entomology

**Symbol & number**: MLS-ENT-247

**Duration and credits**: 15 weeks (3 CHs)

**Intended students**: Semester 4

**Prerequisites**:

**Outline**

This COURSE is concerned with vector and venous organisms surveillance and control, considering the operational control personnel as one of the health team. There is special emphasis on insects and closely related arthropods that impact human health. It describes the life cycles of the vectors and parasites, their geographical distribution, ecology, and the epidemiology, presentation and broad management and control of the diseases caused by them. These include parasites of the intestinal tract, blood-borne parasites and those found in other body sites.

**Rationale**

Insects and arachnids are associated with many parasitic infections and tropical diseases, therefore knowledge of their characteristics, breeding, feeding habits and life cycles essential for the successful prevention and control of the diseases

**General objectives:**

By the end of this course the students are expected to:

* Acquire knowledge about the tropical and subtropical problems.
* Recognize the various species of insects and arthropods involves in human disease.
* Describe the morphology of human parasites and the clinical pictures of parasitic diseases and develop a skill of differentiating between them.
* Be aware of the basics of management and control of such diseases, including pests control.
* Perform health education on behavioral and environmental preconditions promoting the transmission and control of the disease.

**Specific objectives**

**By the end of this course the student is expected to:**-

* Discuss the anatomy, physiology and ecology of insects of medical importance.3-Discuss insecticides and control of insects of medical importance.
* -Dissect and identify insects.
* By the end of this course medical laboratory student should be able to: transmission
* –Describe characteristics, classification, development, and the morphology of arthropods.
* - perform the measures adopted for control and eradication of arthropods of medical importance.
* Outline and detect developmental stages of parasites inside the insect and the behavior of insects
* describe breeding sites of medical importance insect , habitat and their distribution in Sudan
* describe modes of actions of insecticides
* define and discuss the biological control of the insects
* Describe and diagnose mayasis

Educational strategies:

1-Lectures: power point presentations of the main topics.

2-Practicals: Practical’s in all bn asic parasitological techinques .

Evaluation and assessment methods:

Assignment and tutorials %10

Final exam %90(theory 80+Practical 20)

**Required resource :**

Staff members: 3 (laboratory scientist)

Lecture room: For 20 students

**Reference**

1. Beaver , P.C ;Jung , R.C. and Cupp , E.W.(1984).Clinical parasitology , 19 th end. Lea and Febriger , Philadelphia.
2. Robert , L. S. and Janovy ,J. (2000).Foundation of parasitology , 6 edition.MC Graw-Hill , Boston,.
3. Cheesbrough ,M. (1999).Introduction to medical laboratory manual for tropical countries, Volume 1 .Cambridge University Press ,United Kindom.
4. Medical Entomology. Mike W. Service. 2nd edition. Cambridge U. Pess 2000.

|  |
| --- |
| **Semester Five**  **Syllabus** |

**Code of the course:** MLS-CHE-351

## *Course Title and NO : Chemical Pathology 3*

## *Course duration : 15 weeks*

## *Credit hour : 2 hours/ week*

## *Intended students : Semester 5*

## *Prerequisite : clinical chemistry2, lab safety, mathematics, scientific English, Biochemistry and Physiology of human body.*

**Introduction &Rationale:**

Clinical chemistry is that discipline which applies basic biochemistry and analytical chemistry to medical diagnosis, treatment and management. It provides a sound, objective basis on which to gauge the extent of a clinical disorder, the biochemical consequences of a particular disease process and the response to therapy.

General objectives:

1. Quality control, and control materials and state their use in the clinical laboratory.

2. The need for control charts in the clinical laboratory and describe how to enter data on a control chart

3. The biosynthesis of urea , creatinine and uric acid

4. The physiological functions and regulation of sodium, potassium and chloride in the body and list the healthy reference interval for each.

5. The biochemistry and disorders of, NON protein Nitrogen substance , plasma lipid, enzyme , Electrolytes used for their assessment

**SPECIFIC OBJECTIVE**

**Upon completion of this course the student should be able to:**

1. Describe the principle , specimens of choice , and the advantages and disadvantages of the methods used for analysis of urea , creatinine and uric acid
2. Perform biochemical analysis for estimation of urea , creatinine , uric acid and perform creatinine clearance test
3. Discuss the physiological functions and regulation of sodium, potassium and chloride in the body and list the healthy reference interval for each.
4. Describe the function and clinical significance of urea , creatinine and uric acid.
5. Discuss the important rule of urea measurement as a marker of kidney function
6. Identify the uric acid and state its role in the pathogenesis of gout and urinary tract stones
7. List the specimen requirements ,analytical methods , principles and possible analytical interferences for urea, creatinine and uric acid
8. State the principle of the iron-selective electrode method specifically and chloride in the body and list the healthy reference interval for each
9. To know body distribution , hormonal control and disorders of plasma calcium and phosphate , and precaution for plasma calcium and phosphate estimation
10. Identify and utilize the westgard rules for interpretation of laboratory control data and apply the westgard rules to actual control data and determine what actions must be taken to correct out-of- limit control values.

Course outline:

1.Quality control

Quality Control and quality assurance

Types of Errors

Precession and accuracy study

Control material and stander

Statistical concepts in quality control

Westgard multi control rules

## 2.NPN

Urea

Creatinine

Uric acid

3.electrolytes

Sodium and potassium

Calcium and phosphorus

**Methods of student’s assessment**:

* **Course evaluation:**

1. Mid semester examinations run by internal examiners as well as final examinations. (20%).
2. Evaluation consists of 2 computer exams (100%).
3. Practical (2 practical examination) (100%).

Methodology:-

The methods of instruction are:-

1. Lecture.
2. Practicals.
3. Seminars and Tutorials.

References:

1. Carl A. Burtis, Edward R. Ashwood, Tietz Fundamentals of Clincal Chemistry W.B. Saunders, 2001.

2. Michael L.Bishop Clinical Chemistry: Principles, Procedures and Correlations, fifth edition, 2005

3. Alan H. Gowenlock, Janet R. Mc Murray, Varrley’s practical clinical biochemtry, sixth edition, 2001

**Code of the course:** MLS-BC-352

**Title of the course:**  Blood Cells Disorders

**Intended Semester:** Semester 5

**Course duration:** 15 Weeks

**Credit hours:** 3 hours

**General objectives**

By the end of this course, the medical laboratory students should understand pathophysiology, mechanism, and laboratory investigations intended to diagnose these types of anemias.

**Specific objectives**

Upon the completion of the course the students should be able to

* Understand pathophysiology and laboratory diagnosis of Iron deficiency anaemia.
* Understand pathophysiology and laboratory diagnosis of megaloblastic anaemia.
* Understand pathophsiology and laboratory diagnosis of haemolytic anaemia.
* Know the laboratory methods that used to diagnose the above-mentioned types of anaemia.
* Perform laboratory tests intended to screen and confirm all these types of anaemia
* Classify and distinguish both the benign white cells disorders using the international classification systems.
* Perform basic haematological tests intended to diagnosis of infectious mononucleosis.
* Perform advanced investigations using immunological, cytogenetic and molecular techniques.
* Determine the patients' response to treatment through appropriate lab procedures.
* Determine the routine hemocytometric and other tests that are used to evaluate the benign white cell disorders.
* Classify malignant white cells disorders using the international classification systems.
* Perform basic haematological tests intended to diagnosis of leukaemias and lymphomas diagnosis.
* Perform advanced investigations using immunological, cytogenetic and molecular techniques.
* Determine the patients' response to treatment through appropriate lab procedures.
* Diagnose the Minimal Residual Disease (MRD).
* Participate in medical research aiming at comprehensively studying leukaemias, lymphomas and other white cells disorders.

**Instructional methods**

* Lectures
* Laboratory Practical
* Tutorials

**Evaluations**

Final examinations run by internal examiners.

* M.C.Q 10 %
* Short constructive questions 20%
* Practical 40%
* Oral 10%

**Course description**

The course covers the following subjects

**Lectures**

**Week (1)** Anemia

* Mechanism and causes.
* Definition and classification

**Week (2)**

Iron deficiency anaemia

* Definition and pathophysiology
* Causes and clinical features

**Week (3)**

Laboratory diagnosis of iron deficiency anaemia

* Hematological findings
* Biochemical methods (serum ferritin, serum iron and TIBC).

**Week (4)**

Assessment of iron profiles and red cells protoporphyrin

* Serum iron and IBC.
* Serum ferritin and red cells protopophyrin.

**Week (5)** Megaloblastic anaemia

* Vitamin B12 deficiency
* Folic acid deficiency

**Week (6)**

Laboratory diagnosis of megaloblastic anaemia

* Haematological findings
* Biochemical tests and schilling test

**Week (7)**

Assessment of vitamin B12 and folate

* Microbiological methods
* Radiometerical method

**Week (8)**

Haemolytic anaemia

* Definition and classification
* Evidence of haemolysis

**Week (9)**

Confirming the existence of haemolytic anemia

* Haematological findings
* Biochemical methods

**Week (10)**

Hemolytic anemia due to membrane defects

* Spherocytosis: pathophysiology and lab finding.
* Elliptocytosis: pathophysiology and lab finding.

**Week (11)**

Assessment of red cells membrane defect

* Hematological methods.
* Special tests (osmotic fragility, glycerol lysis test and auto haemolysis test).

**Week (12)**

Haemolytic anemia due to enzyme defect

* G6PD deficiency.
* Pyrovate kinase deficiency.

**Week (13)**

Assessment of red cells enzymes:

* Assessment of G6PD
* Assessment of Pyrovate kinase.

**Week (14)**

Hemolytic anemia due to external defect

* Autoimmune and drug induced hemolytic anaemia.
* Hemoparasites.

**Week (15)**

Diagnosis of acquired hemolytic anemia

* Hematological findings.
* Immunoassay.

**Practical**

**Week (1)** Complete hemogram (normal samples)

**Week (2)** Complete haemogram (iron deficient samples)

**Week (3)** Peripheral blood and bone marrow spots

**Week (4)** Assessment of serum iron and IBC

**Week (5)** Iron stain

**Week (6)** Complete haemogram (vitamin B12 & folic acid deficient samples).

**Week (7)** Peripheral blood and bone marrow spots.

**Week (8)** Assessment of serum vit B12

**Week (9)** Assessment of serum folic acid.

**Week (10)** Reticulocyte count.

**Week (11)** Osmotic fragility test.

**Week (12)** Osmatic fragility test (24 hours incubation).

**Week (13)** G6PD screening test.

**Week (14)** Pyrovate kinase assessment.

**Week (15)** Direct anti globulin test.

**Code of the course:** MLS-CES-355

**Title of the course:** Helminthology1 (Cestodes and Trematodes)

**Intended Semester:** Semester 5

**Course duration:** 15 weeks

**Lectures:** 2 hours per week

**Practical:** 2 hours per week

**Credit hours:** 3 (2+1)

**General objectives**

By the end of this course, medical laboratory students should be able to:

1. Understand the pathogenicty of parasites of medical importance.
2. Understand the features and transmission methods of parasitic diseases.
3. Know the technical procedures employed in the diagnosis of parasitic infections in the laboratory.

**Specific objectives**

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

1. Describe the taxonomy and morphology of helminthes.
2. Identify the factors affecting nutrition, growth, and methods of reproduction and multiplication of platyheminthes of medical importance.
3. Explain the pathogenicity and toxin production of platyheminthes of medical importance.
4. Identify the features and spread of platyeminthes.
5. Demonstrate knowledge the laboratory techniques use for platyheminthes diagnosis.

**Instructional methods**

1. Lectures
2. Practical
3. Tutorials

**Evaluation**

1. Final examinations run by internal examiners
2. The evaluation consists of:

* M.C.Q : 10 %
* Long essays : 20%
* Short questions : 10%
* Practical : 50%
* Oral : 10%

**Course content**

The course covers the following subjects

**Lectures**

|  |  |
| --- | --- |
| **Week (1)** | Introduction to Helminthology (Classification) |
| **Week (2)** | Trematoda (Introduction and classification) |
| **Week (3)** | Blood flukes (Schistosoma spp) |
| **Week (4)** | Schistosoma mansoni |
| **Week (5)** | Schistosoma haematobium |
| **Week (6)** | Schistosoma japonicum & Schistosoma intercalatum |
| **Week (7)** | Amphistoma and Distoma Flukes. (Fasciola hepatica, Fsciolopsis buski, Fasciola gigantica) |
| **Week (8)** | Paragonimus |
| **Week (9)** | Heterophyes heterophyes & Chlonorches sienensis |
| **Week (10)** | Taenia saginata |
| **Week (11)** | Taenia solium, Hymenolipes nana, Hymenolipes deminuta |
| **Week (12)** | Echinococcus granulosus 1 |
| **Week (13)** | Echinococcus granulosus, Echinococcus multilocularis II |
| **Week (14)** | Diphylobothrium latum, Spragnosis. Dipylidium caninum |
| **Week (15)** | Revision |

**Practical**

Including the principal laboratory techniques and diagnostic measures:

**Week (1)** Orientation to Helminthology diagnosis

**Week (2)** Morphology Trematoda

**Week (3)** Schistosoma adults, meracidea, and cercaria

**Week (4)** Schistosoma mansoni ova and snail

**Week (5)** Schistosoma haematobium ova and snail

**Week (6)** Laboratory diagnosis of Schistosomiasis

**Week (7)** Fasciola hepatica, Fsciolopsis buski and Fasciola gigantica

**Week (8)** Paragonimus westermani all stages

**Week (9)** Heterophyes heterophyes & Chlonorches sienensis all stages

**Week (10)** Taenia saginata adult, ova ,segment and larvae

**Week (11)** Taenia solium adult, ova, segment, and larvae.Hymenolepis nana and Hymenolepis diminuta all stages

**Week (12)** Echinococcus granulosus all stages

**Week (13)** Echinococcus multilocularis all stages

**Course title**: Histopathological and Cytological techniques 1

**Course symbols and numbers**: MLS -HIST-354

**Duration and credits**: 15 weeks (3 CHs)

**Student coordinator:**

***Outline***

This is a seven –week-block module. It covers (1) the basics of tissue preparation for light microscopy, (2)cellular and tissue decay and basics of tissue fixation :types of histological cytological fixatives.(3)the process of dehydration ,clearing and embedding in paraffin wax and the other embedding media and (4)tissue sectioning. It also covers 5)basics of cytological and histological staining and the common techniques for special staining of cells and tissues and how to prepare these stains .It describes (6) the non sectioninhg methods for processing cells and tissue for light microscopy such as smears and imprints,(7) training on equipments of histological techniques as tissue processors embeddig centers ,rotary and automatic microtomes, multi-program automatic linear and rotary slides strainers and coverslippers,(8) the basics of immunohistochemical staining, (9) performing immunohistochemical staining, (10) identifying results and(11) applying safety measures in histology laboratories.

***Rationale***

The study of this course is most important since it contains important diagnostic methods of diseases that we come across during the whole span of life such as amyloidosis and others. As well as some advanced methods that helps to differentiate types of cancer.

***General objectives***

***By the end of this course the student is expected to***:

* Describe the classification and methods of demonstration of Proteins and nucleoprotein.
* Describe the classification of carbohydrates and their methods of demonstration in fixed tissues.
* Describe the classification of Amyloid and the methods of its demonstration
* Understand the function of connective tissue fibers and Methods for their demonstration as well as the connective tissue cells and ground substance
* Differentiate between pigments and artefacts.
* Describe a procedure for the identification of an unknown pigment.

***Specific objectives***

***By the end of this block the student is able to:***

1. State the theory of the staining method used in nucleoprotein demonstration as well as the reagent used and their function.
2. State recommended fixative and any effects on staining and according to the most appropriate staining method for nucleoprotein demonstration
3. Describe extraction methods of nucleoprotein and differences between these methods.
4. Recognize errors and describe corrective procedures during nucleoprotein demonstration
5. State the purpose of diastase, digestion of glycogen.
6. List appropriate control tissues and methods used in nucleoprotein of demonstration including Feulgen reaction , Methyl green pyronin and Galocynin chrom alum
7. State the theory of the staining method used in carbohydrate demonstration as well as the reagent used and their function.
8. State recommended fixative and any effects on staining and according to the most appropriate staining method for carbohydrate demonstration
9. Describe expected staining results as well as errors and describe corrective procedures for carbohydrate demonstration.
10. State the purpose of diastase, digestion of glycogen.
11. List appropriate control tissues for carbohydrate their methods of demonstration including Periodic acid Schiff with diastase , Alcian blue stain (pH 1.0 and 2.5) and Toluidine blue method
12. Differentiate between primary and secondary amyloidosis.
13. State the purpose and theory of the Congo Red method used in demonstration of Amyloid .
14. List the reagents used and their function as well as state recommended fixatives for Amyloid demonstration

***Evaluation and assessment methods:***

Attendance %10

Assignments and turorials % 20

Final exam %80

***Resources and tools:***

Staff members 2 histologist and 2 laboratory technologist

Lecture room For 80 students

Laboratory For 80 students

***Recommended reading material.:***

Bancroft, JD and Stevens. A, Theory and Practise of Histological Techniques. 1996, Churchill Livingstone

Drury, RAB and Wallington, EA. Carleton's Histological Technique, 5th ed. 1980, Oxford University Press

Kumar, Robbins and Cotran Pathological Basis of Disease, 7e, WB Saunders, ISBN 808923021[IE]

Underwood, General and Systemic Pathology, 3e, Churchill Livingstone, ISBN 0443062862 [IE].

Wheater’s Basic Histopathology- Churchill Livingstone, ISBM 044307024

Rang, Parmacology, 5e, Churchill Livingstone, ISBN 0443072027[IE].

Patel, Lecture Notes on Radiology, Blackwell, ISBN 0632047585.

**Code of the course:** MLS-BAC-353

**Course Title:** Basic Bacteriology (2)

**Intended semester:** Semester 5

**Course duration**: 15 weeks

**Lectures**: 2 hrs/ week.

**Practical:** 2 hrs/ week.

**Credit hours:** 4 (2+2)

**GENERAL OBJECTIVE :**

By the end of this course, medical laboratory students should be able to:

Know the general properties of pathogenic bacteria, and their role in the causation of disease.

Perform the laboratory methods used for of isolations, identifications, of bacterial infections.

**SPECIFIC OBJECTIVES:**

Know the properties, pathogenecity, and infections caused by Clostridia, Corynebacteria, and Bacillus species & able to perform the diagnosis of these bacteria.

Know & perform the laboratory diagnosis, transmission, and prevention of bacterial infection caused by Listeria, Enterobacteria, Campylobacter, Pseudomonas, & Vibrio.

**Instructional methods:**

Lectures

Laboratory practical

Tutorials

**Evaluation:**

1. Final examination runs by internal examiners.

**Evaluation consists of:**

MCQs

Case study

Short questions

Practical

Activities

###### Course contents:

###### Lectures:

**Week (1)** Bacillus

**Week (2)** Corynebacteria

**Week (3)** Clostridia

**Week (4)** Listeria and Erysipelothrix

**Week (5)** Classification of gram negative rods

**Week (6)** Escherichia coli

**Week (7)** Salmonella

**Week (8)** Shigella

**Week (9)** Proteus and Morganella,

**Week (10)** Providencia and Serratia

**Week (11)** Klebsiella, Citrobacter and Enterobacter

**Week (12)** Campylobacters species and Helicobacter pylori

**Week (13)** Pseudomonas and Alcaligenes

**Week (14)** Vibrios.

**Week (15)** Tutorial

**Practical:**

**Week (1)** Bacillus

**Week (2)** Corynebacterium

**Week (3)** Clostridia

**Week (4)** Listeria and Erysipelothrix

**Week (5)** Biochemical of gram negative rods

**Week (6)** Escherichia coli

**Week (7)** Salmonella and laboratory diagnosis of enteric fever.

**Week (8)** Shigella

**Week (9)** Proteus and Morganella,

**Week (10)** Providencia and Serratia

**Week (11)** Klebsiella, Citrobacter and Enterobacter

**Week (12)** Campylobacters species and Helicobacter pylori

**Week (13)** Pseudomonas and Alcaligenes

**Week (14)** Vibrios.

**Week (15)** Revision

**References:**

**Brook, G. F.; Butel, J.; Ornston, L.; Jawetz, E.; Melnick, J.; Adelberg, E.** **(2007).** Medical Microbiology 20th edition. Appleton and long. California

**Collee, J. G.; Marmion, B. P.; Fraser, A. G.; Simmons, A.** (1996). Mackie and MacCarteny Practical Medical Microbiology 14th edition. Churchill Livingston New York**.**

**Mims, C.; Dockrell, H. M.; Goering, R.V.; Roitt, I.; Wakelin, D.; Zuckerman, M. (2004)** Medical Microbiology Elsevier Mosby updated 3rd edition

**Cheesbrough, M. (2004)** Medical Laboratory Manual for tropical countries volum.2. Microbiology**. 1962** Cambridge University Press.

**Green wood, D.; Slack, R.; and peutherer, J. (1992).** Medical microbiology. 14thedition. London: Churchill living stone.

**Course Title Course Code: Advance** Molecular Biology (MLS-MOLB-356)

**Credit hours :3**  Hours

**Duration :** 15 weeks

***Prerequisites:***

Biochemistry. Molecular Biology.

***Rationale:***

Provide the student with basic skills to perfume molecular techniques and its application in medical fields.

***Course contents:***

**Molecular Techniques:**

DNA extraction : 1- Manual ; Phenol- Chloroform, salting out and CITAB

1. Kits
2. Automated machines

RNA extraction

Estimation of DNA concentration nanogram per microliter ng/μl

DNA stock solution preservation and working solution preparation

DNA probe technique: general probe and type specific probe

DNA cloning ; steps and cloning vectors, viral, bacterial and fungal YAC and BAC

Conventional PCR and gel electrophoresis

Types of PCR reverse transcriptase PCR, degenerate PCR, type specific PCR and multiplex PCR

Real Time PCR rtPCR : Syber Green rtPCR and TaqMan rtPCR

DNA sequencing manual and automated DNA sequencers

Second and third generations of DNA sequencers.

Microarray-Based Microbial Identification and Characterization

**Applications**

Diagnosis of genetic and parasitic diseases:

Genetic Diseases and cancer

Viral diseases: DNA viruses and RNA viruses : HSV-1, HSV-2, varicella-zoster , Epstein–Barr virus (EBV) parvovirus B19, human polyomaviruses of BK and JC, and human herpesviruses 6, 7, hepatitis A virus hepatitis C (HCV;

Bacterial diseases: Bacterial Identification Based on 16S Ribosomal RNA Gene

Neisseria gonorrhoeae, Streptococcus pneumoniae, Staphylococcus aureus and Mycobacterium

Protozoal diseases: Trypanosomiasis, Leishmaniasis, Malaria, Amoebiasis, Giardiasis, Trichomoniasis

Helminthes diseases:

Fungal diseases

***Course out comes:***

***By the end of the course, students are expected to achieve the following specific objectives:***

**Course Outcomes:**

By the end of this course the student should be able to:

1. Differentiate between molecular techniques: their theoretical backgrounds, types, sensitivity, specificity, advantages, disadvantages, when to use each one, how to confirm their results and how to avoid contamination.

2. Understand the applications of Molecular Biology in different disciplines.

3. Be familiar with advantages, hazards of biotechnology, ethics and how to implement safety measures.

***Educational Strategies and Methods:***

1. Lectures.
2. Tutorial.
3. Group work.
4. Seminars

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %
2. Final exam (written (MCQs & structured questions + practical) 70 %.

***Required Resources (in details):***

1. Lecture room with multimedia.
2. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Turner, P.C., Turner, Turner, M. and Bates, W. (2000) Instant notes in molecular biology. 2nd edn. New York: Garland Publishing.

Lodish, H., Darnell, J.E., Berk, A., Matsudaira, P., Kaiser, C.A. and Krieger, M. (2003) Molecular cell biology. 6th edn. New York: Freeman, W. H. & Company.

Watson, J.D., Laboratory, C.S.H., Baker, T.A., Technology, M.I. of, Bell, S.P., Gann, A., Levine, M., Berkeley, Losik, R. and Gann, er (2013) Molecular biology of the gene, 7/e. 7th edn. Boston: Benjamin-Cummings Publishing Company, Subs of Addison Wesley Longman.

Alberts, B., Johnson, A. and Lewis, J. (2014) Molecular biology of the cell. United States: Palgrave Macmillan.

Course Title: Health information system (MLS-HINF-357)

**Course credit hour:** (2CH)

Outline

A two- week block module which introduces health information system (HIS)- terminology, classifi­ cation and setup. The students need to spend sometime in the relevant department in the Federal and State Ministry of Health to see how the data is collected and compiled It includes also the internet sources of HIS, they should prepare a critique of the current systems and suggest a design or protocol for better organization and computation of the laboratory data collected

Rationale

This course is to provide students with a broad understanding of the challenges facing health executives in selecting and implementing a health information system. The course is also designed to provide context for the growing discussion on electronic medical records, health information exchange and its impact on the internal and external environments shaping the healthcare industry

# General Objectives

***By the end of this course a student should be able to:***

1. Understand the Health System of the Sudan with especial emphasis on Primary Health Care (PHC).
2. Describe the demographic characteristics of the Sudan..

# Specific Objectives

***By the end of this course a student should be able to:***

1. Know the Importance of health information system
2. Be familiar with the different aspect of Laboratory management information system (LMIS
3. Capable to identify different component of Data quality
4. Able to write standard lab format )
5. Know how to write Death certificate and its importance in health information system
6. Know the concept of ICD 10 in general and ICD-O in particular
7. Know the Role of laboratories doctors in surveillance system ( notifiable disease malaria, immunization)
8. Able to identify the Cancer registry importance and function
9. Know different type of indicator

**Education strategies and methods :**

Power point slide

Field work

Self directed learning

Seminars

**Evaluation & assessments methods :**

Final course exam …………………………….80%

Seminars ………………………………………10%

Attendance …………………………………… 10%

**References:**

Lecture note

|  |
| --- |
| **Semester Six**  **Syllabus** |

**Code of the course:** MLS-CHE-361

**Course Title and NO : Chemical Pathology-4**

**Course duration : 15 weeks**

**Credit hours : 3 Hours/week**

**Instructor office : Chemical Pathology**

**Prerequisite : biochemistry and physiology of human body**

**And chemical pathology-5.**

**Introduction:**

Modules of this course cover the chemical aspects of medical laboratory analyses that include triglycerides and cholesterol blood concentration and the effect of change of their blood levels. It also covers blood ions and their effect on body functions and their disorders and measurements. The course covers parts linked with particular emphasis on the enzymes and Lipids.

General Objective:

Upon completion of this course the student should be able to:

1. Explain lipid / lipoprotein physiology and metabolism, describe the clinical tests used to assess them including principles and procedures, relate the clinical significance of lipid and lipoprotein values in the assessment of coronary heart disease, and discuss the incidence and types of lipid and lipoprotein abnormalities.
2. Define enzyme, including physical composition and structure; classifyenzymes according to the international union of Biochemistry; list the major kinetic parameters used to describe enzyme activity; and explain why the measurement of serum enzyme levels is clinically useful.

Specific Objective:

Upon completion of this course the student should be able to: -

1. Identify the enzymes most commonly used in the assessment of hepatobiliary disease.

1. Describe digestion, absorption and metabolism of cholesterol and triglycerides including the role of the liver and adipose tissue.
2. Describe the synthesis and catabolism of HDL, LDL, VLDL, and chylomicrons.
3. Discuss the risk factors for coronary heart disease.
4. State the clinical significance of hyperlipidemia.
5. Discuss the types of lipoproteinmias with respect to lipid and lipoprotein levels, appearance of the specimen and genetic etiology.

1. Demonstrate knowledge of the international union of biochemistry (IUB) classification of enzymes and why other names are used.
2. Discuss the different factors affecting the rate of an enzymatic reaction.

9. Evaluate patient serum enzyme levels in relation to disease states, and discuss which enzymes are useful in the diagnosis of cardiac disorders, hepatic disorders m bone disorders, muscle disorders, malignancies and acute pancreatitis.

10.Discuss the tissue sources, diagnostic significance and assay, including sources of error, for following enzymes: ALP, AST, and ALT.

Course Outline:

1. Lipids:-

* 1. lipid metabolism
  2. serum crholesterol.
  3. serum triglyceride.
  4. Lipoproteins and apolipoproteins.
  5. Plasma lipid disorder
  6. Method of estimation

2. Enzymology:

a) definitions , factors affecting plasma enzyme assay

b) Alkaline phoshatase.

c) AST.

d) ALT.

**Practical:**

**Each lecture should be matched with its practicals**

Methodology:

The methodology of instruction are:-

1. Lecture.
2. Seminars and Tutorials.

Evaluation: -

1. Mid semester examinations run by internal examiners as well as final examination 20%.
2. Evaluation consists of short notes questions, multiple –choice questions (MCQs) examinations 80%.

**Course Title Course Code:** Immunohematology andBleeding Disorders (MLS-HEM-362)

**Credit hours :** 3 Hours (2+1)

**Duration : 15 weeks**

**Disciplines involved :** Hematology and Immunohematology

***Prerequisites:*** Molecular and cell biology

## *Course contents:*

This is a four-week block, during which the students are lead to comprehensive study of the bleeding and coagulation disorders and the investigations intended to diagnose and monitor these cases.

## *Rationale:*

Bleeding and thrombosis are life-threatening disorders that need close medical supervision. Diagnosis of these disorders necessitates application of up-to-date laboratory techniques which are also used to monitor the anticoagulant therapy.

## *General objective:*

This course aims at studying the bleeding and coagulation disorders and their lab diagnosis in addition to follow-up of treatment.

***Course out comes:***

***By the end of this course the student is expected to achieve the following specific objectives***:

1. Classify the bleeding disorders.
2. Classify the coagulation disorders.
3. Perform investigations intended to monitoring of the anticoagulant therapy.
4. Perform haemophilia investigations and determine the relevant doses of the deficient factor.
5. Diagnose and monitor DIC.
6. Recognize the different types of blood group systems and do blood grouping
7. Identify the appropriate and inappropriate uses blood components’ in transfusion
8. Recognize the organization, planning and management of blood bank
9. Describe the prevention, and laboratory diagnosis of blood transfusion complications
10. Perform all investigations intended for safe blood transfusion, laboratory investigation intended to diagnose HDN &HTR

***Practical:***

1. PT + APTT +TT.
2. Factor assay.
3. Assay of coagulation factors.
4. D-dimer tests+ case study.
5. Lab. Assessment of Platelets.
6. Detection of FDPs.
7. Lab. Control of thrombolytic therapy.

***Educational Strategies and Methods:***

1. Lectures.
2. Practical sessions
3. Tutorial.
4. Group work.
5. Seminars

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room with multimedia.
2. Laboratory
3. Staff (Prof, Associate Prof. OR Assistant Prof).
4. Lab. practical staff (MSc).

***References:***

Hoffbrand, V. and Moss, P.A.H. (2015) Hoffbrand’s essential Haematology. Hoboken, NJ, United States: John Wiley & Sons.

Bain, B.J., Bates, I., Laffan, M.A. and Dacie, J.V. (2011) Dacie and Lewis practical Haematology: Expert consult: Online and print. 11th edn. Edinburgh: Elsevier Churchill Livingstone.

Mehta, A.B., Hoffbrand, V.A. and Hoffbr, V.A. (2005) Haematology at a glance. 2nd edn. Malden, MA: Blackwell Publishing.

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

Heilmeyer, L. and Begemann, H. (2004) Atlas of clinical Hematology. Edited by Helmut Loffler, Johann Rastetter, and Torsten Haferlach. 6th edn. Berlin, Germany: Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

Medicine, D. of, Pediatrics, D. of H., Chair, V., Stanford, Anatomic, D. of, Services, C.P., Pathology, S., List, A.F., Member, S., Hematology, M., CEO, M.C.C., Florida, T., Means, R.T., Medicine, I., Paraskevas, F., Immunology, R., Rodgers, G.M., Pathology, U., Center, H.S., Director, M., Laboratory, C., Laboratories, A., City, S.L., Emeritus, J.F. and Emertius, P. (2013) Wintrobe’s clinical hematology. Edited by John P. Greer, Daniel A. Arber, and Bertil E. Glader. 13th edn. Philadelphia, PA, United States: Lippincott Williams and Wilkins

Course title: advance microbiology

Course symbols and numbers: (MLS -MIC-363)

Duration & credits 15weeks (3chs)

***Outline***

This is a four week-block module during which the basic microbiological techniques reviewed and focus on the study of : (1) major group of cocci, bacilli and acid fast bacilli including their morphology ,functional and biochemical structure ,(2) method of causing disease (3)a brief clinical description of disease to decide on the most proper sample from which to isolate the organisms and study their requirements.(3)exclusion and inclusion criteria in the reception of the sample .(4) introduction to virology and mycology.

***Rationale***

Clinical microbiology is amongst the most widely studied and followed branches due to its great importance to medicine. Along with providing a deep knowledge and understanding of the nature of pathogens this line of study has also been applied in several immunological innovations in the field of medical science. The field of medical microbiology is engaged with identifying new microorganisms, monitoring changes in rapidly mutating species, and dealing with ongoing challenges in microbiology**.**

Microbiology laboratories are the first line of defense for detection of new antibiotic resistance, outbreaks of food borne infection. Maintaining high-quality clinical microbiology laboratories on the site of the institution that they serve is the current best approach for managing today's problems of emerging infectious diseases and antimicrobial agent resistance by providing good patient care outcomes that actually save money .

***General*** ***objectives***

***By the end of this course the student is expected to***:

1. familiarize with the techniques necessary to grow and identify microorganisms
2. recognition and differentiation of microbial characteristics in culture
3. identify a mixture of two unknowns organisms .

***Specific*** ***objectives***:

***By the end of this block the student be able to:***

1.Identify the species of pathogenic bacteria and fungi

2.    Determine the modes of transmission of infectious diseases and pathogenesis

3.    Explain of the theoretical foundations for the differentiation of the major pathogenic groups

4.  Perform diagnosis of Gram-negative bacteria of the family Enterobacteriaceae, Pseudomonas, vibrios ,brucella ,and bacillus

5.    Perform diagnosis of Gram-positive bacteria from the family Staphylococcus and Streptococcus

6.    Perform diagnosis of Gram-negative bacteria: Neisseriae, Mycobacteria, Anaerobs

7.    Use methods for diagnosis of different types of uncommon pathogens

8.    The use of biochemical and serological tests in the diagnosis of the above-mentioned types of bacteria

9.    Illustrate the common components of a virus, using an example.

10. Describe the two methods of viral replication (Lytic and Lysogentic).

11. Compare and contrast the lifestyle of viruses with different genomes (e.g. DNA and RNA)

12. Explain the major characteristics used to classify viruses.

13. Compare and contrast culturing of bacteria with culturing of viruses

14. Describe the major characteristics of the Kingdom Fungi and properly classify organisms into this kingdom

***Education strategies and methods :***

Power point slide

Laboratory practice

Assignments

***Evaluation & assessments methods :***

Mid course exam 10%

Final theory exam 40%

Final practical exam 30%

Spot exam 1o%

Assignments 5%

Attendance 5%

***References :***

1. District Laboratory practical. In Tropical Countries cheesbrogh , 1 & 2, 978 – 0521676328,978 -0521676311
2. microbiology, Green world + Patherer + Barer, chwchil 978 – 0443102103
3. Medical microbiology, Green world + Patherer + Barer, chwchil 978 – 0443102103

**Title of the course:** Helminthology2 (Nematodes) MLS-NEM-365

**Intended term**: (6)

**Course duration**: (15) weeks

**Lectures:** 2 hours per week

**Practical**: 2 hours per week

**Credit hours**: 3 (2+1)

**General objectives**

By the end of this course, medical laboratory students should be able to:

1. Understand the pathogenicty of parasites of medical importance.
2. Understand the features and transmission methods of parasitic diseases.
3. Know the technical procedures employed in the diagnosis of parasitic infections in the laboratory.

**Specific objectives**

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

1. Identify the taxonomy and morphology of Nematodes.
2. Explain the factors affecting nutrition, growth, and methods of reproduction and multiplication of Nematodes of medical importance.
3. Identify the pathogenicity and toxin production of Nematodes together with the allergens resulting form their pathogenic effects
4. Explain the features and spread of Nematodes.
5. Recognize the laboratory techniques use for Nematodes diagnosis.

**Instructional methods:**

* 1. Lectures
  2. Practical
  3. Tutorials

**Evaluations**

Final examinations run by internal examiners

The evaluation consists of:

* M.C.Q : 10 %
* Long essays : 20%
* Short questions : 10%
* Practical : 50%
* Oral : 10%

**Course content**

**The course covers the following subjects:**

**Lectures**

**Week (1):** Nematodes (Introduction and Classification)

**Week (2):** *Ascaris lumbricoides*

**Week (3):** *Trichuris trichura*

**Week (4):** *Enterobius vermicularis*

**Week (5):** Hook worms

**Week (6):** *Strongyloides stercoralis*

**Week (7):** Larva migrans

**Week (8):** Examination of blood for Helminthes

**Week (9):** *Wuchereria bancrofti*

**Week (10):** *Loa loa*, *Mansonella spp*

**Week (11):** *Brugia malayi, Brugia timori*

**Week (12):** *Onchocerca volvulus*

**Week (13):** *Dracunculus medinensis*

**Week (14):** *Trichenella spiralis*

**Week (15):** Revision

**Practical**

Including the principal laboratory techniques and diagnostic measures:

**Week (1):** General Morphology of Nematodes

**Week (2):** *Ascaris lumbricoides* all stages (Laboratory diagnosis for larva migrans)

**Week (3):** *Trichuris trichura* all stages

**Week (4):** *Enterobius vermicularis* all stages

**Week (5):** Hook worm all stages

**Week (6):** *Strongyloides stercoralis* all stages

**Week (7):** Laboratory diagnosis of larva migrans

**Week (8):** Blood concentration techniques

**Week (9):** *Wuchereria bancrofti* all stages

**Week (10):** *Lao loa* all stages

**Week (11):** *Brugia spp*

**Week (12):** *Onchocerca volvulus* all stages (Skin snip, biopsy, and tissue processing for tissue worms)

**Week (13):** *Dracunculus medinensis*

**Week (14):** *Trichenella spiralis* all stages

**Week (15):** Revision

**Course title**: Histopathological and Cytological techniques 2

**Course symbols and numbers**: MLS -HIST-364

**Duration and credits**: 15 weeks (3 CHs)

**Student coordinator:**

***Outline***

This is seven –week-block module. It covers (1) the basics of tissue preparation for light microscopy, (2)cellular and tissue decay and basics of tissue fixation :types of histological cytological fixatives.(3)the process of dehydration ,clearing and embedding in paraffin wax and the other embedding media and (4)tissue sectioning. It also covers 5)basics of cytological and histological staining and the common techniques for special staining of cells and tissues and how to prepare these stains .It describes (6) the non sectioninhg methods for processing cells and tissue for light microscopy such as smears and imprints,(7) training on equipments of histological techniques as tissue processors embeddig centers ,rotary and automatic microtomes, multi-program automatic linear and rotary slides strainers and coverslippers,(8) the basics of immunohistochemical staining, (9) performing immunohistochemical staining, (10) identifying results and(11) applying safety measures in histology laboratories.

***Rationale***

The study of this course is almost important since it contains important diagnostic methods of dieases that we come across during the whole span of life such as amyloidosis and others. As well as some advance methods that helps to differentiate between different types of cancer.

***General Objectives:***

***This course aims at enabling students to :***

* Describe melanin.
* Describe normal versus pathological c of pigment
* State the precautions where applicable during demonstration of protein, nucleoprotein , carbohydrate, Amyloid and connective tissue
* Define cytology and understand different cytological sample
* Define immunohistochemistry and immunoflourescence

***Specific Objectives:***

Upon completion of this course students are expect to:

1. State reason for thicker sections for Amyloid demonstration.
2. Describe staining method.
3. Describe expected staining results as well as errors and describe corrective procedures during Amyloid demonstration
4. List appropriate control tissue for Amyloid and their methods of demonstration.
5. State the theory of the staining method used in connective tissue demonstration as well as the reagent used and their function
6. State recommended fixative and any effects on staining and according to the most appropriate staining method for connective tissue demonstration
7. Describe expected staining results as well as errors and describe corrective procedures during connective tissue demonstration
8. List appropriate control tissue for connective tissue and their methods of demonstration including Van Gieson technique , Masson's trichrome ,Verhoeff's method ,Gomori's aldehyde fuchsin and Gordon & Sweets method
9. State the theory of the staining method used in pigments and mineral demonstration as well as the reagent used and their function
10. State recommended fixative and any effects on staining and according to the most appropriate staining method for pigments and mineral demonstration
11. Describe expected staining results as well as errors and describe corrective procedures during pigments and minerals demonstration
12. List appropriate control tissue for pigments and minerals and their methods of demonstration including Perl's prussian blue , Masson Fontana and von Kossa method
13. Define and differentiate between the different types of pigment which are : Endogenous pigment , Exogenous pigment and Artifacts
14. Perform smears and learn about specimen handling, safety requirements and technical issues involved in non gynecologic sample preparations
15. Utilize conventional smears, and cell blocks techniques.
16. Describe the basics cellular constituents of exfoliative cytology
17. Perform specimens collection, fixation ,preparation, staining and identification of:
18. Squamous epithelium
19. Glandular epithelium
20. Respiratory cytology
21. body fluids
22. Gastrointestinal tract cytology
23. Urine
24. Cerebrospinal fluid
25. The student must show knowledge and skills about common neoplastic and other proliferative disorders of :
    1. The uterine cervix
    2. Respiratory tract
    3. Urinary tract
    4. CSF
    5. Gastrointestinal tract
    6. Body fluids
    7. Fine needle aspiration cytology.
26. Define immunohistochemistry, antigen, antibody, antigen-antibody binding, polyclonal and monoclonal antiserum.
27. Describe labels used in immunohistochemistry and List applications of immunohistochemistry.
28. Describe effects of fixation and processing on immunofluorescence and immunoperoxidase methods.
29. Describe uses of immunofluorescence methods and disadvantages.
30. Describe types of immunofluorescence methods.
31. ***Evaluation and assessment methods:***
32. Attendance %10
33. Assignments and turorials % 20
34. Final exam %70
35. ***Resources and tools:***
36. Staff members 2 histologist and 2 laboratory technologist
37. Lecture room For 80 students
38. Laboratory For 80 students
39. ***Recommended reading material.:***
40. Bancroft, JD and Stevens. A, Theory and Practise of Histological Techniques. 1996, Churchill Livingstone
41. Drury, RAB and Wallington, EA. Carleton's Histological Technique, 5th ed. 1980, Oxford University Press
42. Kumar, Robbins and Cotran Pathological Basis of Disease, 7e, WB Saunders, ISBN 808923021[IE]
43. Underwood, General and Systemic Pathology, 3e, Churchill Livingstone, ISBN 0443062862 [IE].
44. Wheater’s Basic Histopathology- Churchill Livingstone, ISBM 044307024
45. Rang, Parmacology, 5e, Churchill Livingstone, ISBN 0443072027[IE].
46. Patel, Lecture Notes on Radiology, Blackwell, ISBN 0632047585.

***Evaluation and assessment methods:***

1. Attendance %10
2. Assignments and turorials % 20
3. Final exam %70

***Recommended reading material.:***

1. Bancroft, JD and Stevens. A, Theory and Practise of Histological Techniques. 1996, Churchill Livingstone
2. Drury, RAB and Wallington, EA. Carleton's Histological Technique, 5th ed. 1980, Oxford University Press
3. Kumar, Robbins and Cotran Pathological Basis of Disease, 7e, WB Saunders, ISBN 808923021[IE]
4. Underwood, General and Systemic Pathology, 3e, Churchill Livingstone, ISBN 0443062862 [IE].
5. Wheater’s Basic Histopathology- Churchill Livingstone, ISBM 044307024
6. Rang, Parmacology, 5e, Churchill Livingstone, ISBN 0443072027[IE].
7. Patel, Lecture Notes on Radiology, Blackwell, ISBN 0632047585.

**Code of the course:** MLS-IMMU-366

## *Course Title :* Clinical immunology

## *Course duration : 15 weeks*

## *Credit hour : 3 hours/ week*

## *Intended students : Semester 6*

* *Prerequisite :* Basic Immunology

## Introduction &Rationale:

By the end of this course the medical laboratory students should be able to:

1. Learn all immunological diseases and immunological mechanics that underline them.
2. Know how to use and apply the immunological techniques

**SPECIFIC OBJECTIVE**

By the end of this course the student should be able to:

1. Understand the tolerance of immunity, immune suppression, immune deficiency, and auto immunity.
2. Know the immunological mechanism against viral, bacterial, fungal, protozoan, and worms infections.
3. Understand the classifications, mechanism, and laboratory diagnosis of all types hypersensitivity.
4. Know the principle of vaccination and vaccine production in addition to immunity to cancer.

Course outline:

* Tolerance and immune suppression.
* Tolerance.
* Immune suppression.
* Auto immunity and autoimmune diseases.
* Auto immunity.
* Auto-immune disease.
* Infection and immunity(1)
* Immunity to viruses.
* Infection and immunity(2)
* Immunity to bacteria.
* Immunity to fugi.
* Infection and immunity (3)
* Immunity to protozoa.
* Immunity to helminthes.
* Primary immune deficiency
* Humoral & CMI deficiency.
* Severe combined immune deficiency syndrome.
* Secondary immune deficiency
* AIDs & HIV infection.
* Immune response to HIV.
* Hypersensitivity(1)
* Classification of hypersensitivity.
* Allergy and mechanism.
* Hypersensitivity(2)
* Hypersensitivity types II.
* Hypersensitivity types III.
* Hypersensitivity(3)
* Hypersensitivity types IV.
* Hypersensitivity types V & VI.
* Tissue transplantation (3)
* Effects that mediate transplant rejection.
* Current clinical status of transplantation.
* Tissue typing
* Principles.
* Techniques.
* Immunity to Cancer
* Cancer Biology.
* Immunology of Cancer prevention, immunodiagnosis and immune therapy.
* Vaccination
* Vaccine design
* Adjuvant.
* Immunity to Cancer
* Important techniques for immune essay and immune diagnosis
* Available techniques

***Practical***

Gel filtration.

Human basophile degranulation.

ELISA test-1.

ELISA test-2.

Radioimmunoassay (RIA)-1.

Radioimmunoassay (RIA)-2.

Immunofluorescence test (IFT)-1.

Immunofluorescence test (IFT)-2.

Detection of autoantibodies.

Quantifqtation of autoantibodies.

:

* **Course evaluation:**
* Final exam =60%
* Lab =30%
* Seminars = 10%

1. .

References:

1. Williams manual of hematology Marshal. A.licht man , Kenneth kaushansky

Thomas J. Kippas Josef Prchal Marcel I M. leivi, eighth edition 2011-12-29

1. Interpretation of diagnostic tests, Ninth edition Mary A.Willamson. L.Micheal SNYDER

2011.

1. Clinical hematology, theory & procecdries fifth edition, Mary lonise Tugeron 201.
2. Hematology basic principles and practice-fourth edition, Ronlad Hoffman, Edward bene.at, al.
3. Manual laboratory Techniques.
4. Immunology and immunopathology, third edition, yoshitsugi hokama, Robert M.Nakamura.
5. Immunology for medical student, second edition Roderick Narin, Matthew helbert.

|  |
| --- |
| **Semester Seven**  **Syllabus**  **(for all disciplines)** |

**Course title: IN-SERVICE TRAINING**

**Course symbols and numbers: MLS -SER -471**

**Duration and credits: 30weeks (6 CHs)**

**Intended Students: MLS students at semester seven**

***Outline :***

This is an exposure to actual training in health institution laboratories .It includes sending students to well equipped and served hospital to learn how MLS is practiced , and spend a four week apprentice period where they observe ,present and perform actual service under supervision of senior technologist and physician specific detailed log book are designed to assure standardized training.

***Rationale***

The need of the medical laboratory technology student to relate between what they have been studied and the actual work in health facilities.

***General objective:***

***By the end of this course the student should be able to:***

Perform and discuss current techniques used in laboratory departments for diagnosis of diseases.

## *Specific objectives:*

***By the end of this course student is expected to***:

1. Practice the safety methods at work.
2. Know the use of anticoagulants and collection of blood specimens.
3. Perform blood film preparation, staining and examination.
4. Perform hemoglobin estimation.
5. Count different types of blood cells.
6. Perform differential white blood cells count.
7. Measure P.C.V, calculate absolute values and perform E.S.R.
8. Know the principles, procedures, reliability, and significance of electrophoresis.
9. Perform blood grouping and cross matching.
10. Perform first line investigations of bleeding disorders(bleeding time, PT, APTT)
11. Describe different method of sterilization and disinfection used in laboratory.
12. Identify and describe different method used for collection of the sample (swab ,urine, stool, blood……..ect.) in microbiology lab either for direct examination or for culture .
13. Describe the criteria of the rejection of the sample.
14. Describe the general principles of stain technology
15. Identify bacteria based on microscopic and macroscopic morphology, media growth and biochemical testing
16. Compare and contrast methods used to determine bacterial susceptibility or resistance to antibiotics
17. Perform different methods of serological diagnosis .
18. Correlate and apply Microbiology theory with clinical laboratory policies and procedures.
19. Perform, record and evaluate quality control in the Microbiology lab .
20. Describe the design of the request form for parasitological test.
21. Collect urine and stool specimens.
22. Collect peripheral and venous blood for haemoparasites examination.
23. Perform macroscopically examination of stool samples.
24. Perform wet preparation for faecal samples
25. Prepare Giemsa stain
26. Perform thick & thin blood film staining techniques
27. Identifty normal structure found in stool
28. Identify urogenital parasites ( T.v, S.h., E.v,…….)
29. Identify intestinal parasites ( protozoa & helminth parasites)
30. Identify and differentiate between Plasmodium species.
31. Perform ICT for Malaria
32. Perform serodiagnosis of Toxoplasmosis
33. Perform pregnancy test.
34. Perform renal function tests including estimation of urea, creatinine, sodium, potassium and phosphorus levels.
35. Perform liver function test including estimation of total and direct bilirubin,total protein,albumin,ALP,GOT,GPT levels.
36. Perform thyroid function test and estimate fertility hormones.
37. Perform test of blood glucose level.
38. Perform test of lipid profile(s.chlesterol,s.t***riglyceride,HDL,LDL)***
39. Practice and describe different methods of tissue fixation, preparation and processing.
40. Demonstrate knowledge, comprehension, application and entry-level competency in special histological staining techniques for connective tissue, tissue carbohydrates,mucins and pigments.
41. Describe immunofluorescence methods.
42. Define immunohistochemistry, antigen, antibody, antigen-antibody binding, polyclonal and monoclonal antiserum,labeling as well as performing immunohistochemical reaction***.***

***Educational strategy:***

Practice at hospital

***Evaluation and assessment methods:***

Log book 80%

Attendance 20%

***Resources and tools:***

hospital staff 10 laboratory technologist

laboratory departments for 40 students

***Recommended reading:***

Essential hematology, Hoffbrand+Moss+Petti, Blackwell 978-1405136495

Anemias, WHO,Bruce,Evatt,Wiliam

Dacie and Lewis Practical hematology Lewis+Bair+Bstes,Church 978-0443066603

Hematology at a glance 978-1405136495

District laboratory practice in tropical countries part 1 978-0521676328

District laboratory practice in tropical countries part 2

Bancroft, JD and Stevens. A, Theory and Practise of Histological Techniques. 1996, Churchill Livingstone

Drury, RAB and Wallington, EA. Carleton's Histological Technique, 5th ed. 1980, Oxford University Press.

**Course Title Course Code:** Research Methods (MLS-RES-473)

**Credit hours :** 2 Hours (2+0)

**Duration :** 15 weeks

**Disciplines involved :** All Disciplines of MLS

***Prerequisites:***

-------

***Course contents:***

The course discusses the major role of research methodology in the provision of aids of the development power. The course is designed to provide the candidates with Basics, fundamentals and applications in research methods.

***Rationale:***

The study of research methodology is essential for candidates in their development and after graduation bypreparing them to conduct different researches and articles as well as to deal with applied research methods in a rational and professional manner.

***Course out comes:***

***By the end of the course students are expected:***

1. To develop understanding of the basic framework of research process.
2. To develop an understanding of various research designs and techniques.
3. To identify various sources of information for literature review and data collection.
4. To develop an understanding of the ethical dimensions of conducting applied research.
5. Appreciate the components of scholarly writing and evaluate its quality.
6. To familiarize the student with the dimensions and methods of research.
7. To understand some basic concepts of research and its methodologies.
8. To identify appropriate research topics.
9. To orient the student to make an informed choice from the large number of alternative methods and experimental designs available.
10. To select and define appropriate research problem and parameters
11. To enable the student to present a good research proposal.
12. To familiarize the student with the nature of research and scientific writing.
13. To empower the student with the knowledge and skills they need to undertake a research project, to present a conference paper and to write a scientific article.
14. To organize and conduct research (advanced project) in a more appropriate manner.
15. To write a research report and thesis.
16. To empower the student with the knowledge and skills they need of ethical considerations to undertake a research project, to present a conference paper and to write a scientific article.
17. To familiarize the student with the knowledge and skills of research evaluation process to empower their research capabilities.

***Educational Strategies and Methods:***

* 1. Lectures.
  2. Tutorial.
  3. Group work.
  4. Seminars

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %
2. Final exam (written MCQs & structured questions) 70 %

***Required Resources (in details):***

1. Lecture room.
2. Staff (Prof, Associate Prof. OR Assistant Prof).

***References:***

Kumar, R. (2014) Research methodology: A step-by-step guide for beginners. 4th edn. London: SAGE Publications.

Brink, H., van der Walt, C. and van Rensburg, G. (eds.) (2012) Fundamentals of research methodology for health care professionals. 3rd edn. Cape Town, South Africa: Juta Legal and Academic Publishers.

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

**Course Title Course Code:** Biostatistics (MLS-STA-472)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** All Disciplines of MLS

***Course contents:***

In this introductory statistics course we will explore the use of statistical methodology in designing, analyzing, interpreting, and presenting biological experiments and observations. We will cover descriptive statistics, elements of experimental design, probability, hypothesis testing and statistical inference, analysis of variance, correlation, regression techniques, and non-parametric statistical methods. Throughout the course the application of statistical techniques within a biological context will be emphasized, using data from laboratory and field studies.

***Course out comes:***

**By the end of this course, students will be able to do:**

1. Introduction & Describing data: frequency distributions & descriptive statistics (Problem Set 1: Descriptive Statistics & Intro to SPSS)
2. Intro to SPSS (optional): 2-4 pm in Mark Computer Lab @ Tisch
3. Sampling & Experimental design
4. Elements of probability theory & Probability distributions (Normal & Binomial)
5. Introduction to inference; Sampling Distributions & Confidence intervals
6. Hypothesis Testing - Comparing two sample means; Type I & II errors
7. Comparing paired samples; Statistical power
8. Mid-term exam; Conditions for test validity (Assumptions)
9. Conditions for test validity & assessing data normality; Transformations
10. Non-parametric alternatives: Analysis of Variance (ANOVA)
11. Tufts Wed (No class); ANOVA continued
12. Non-parametric alternatives to ANOVA; Multiple comparisons
13. Introduction to bivariate analysis - Correlation & regression; Thanksgiving
14. Linear regression
15. Analysis of categorical data: Goodness-of-fit & Contingency tables.

***Practical of Biostatistics course:***

1. Microsoft Excel.
2. Statistical Package for Social Science (SPSS) program.

# Study Type Determination.

# Observational Studies

# Determination of Association Strength between an Exposure Factor and an Event in Observational Studies

# Increasing Accuracy in Observational Studies

# Organization of Variables and Endpoints

# Measures for Results Expression of a Clinical Trial

# Hypothesis Testing

# Correlating Sample Data with the General Population

# Determination of Normality or Non-Normality of Data Distribution.

# Statistical Assessment of Diagnostic Tests for the medical lab.

# Correlation and Regression.

***Methods of instruction:***

Lectures, seminars and tutorials.

***Methods of evaluation:***

Continuous assessment: 30%

Written Exam MCQs & structured questions: 70%

***References:***

Samuels, M.L., Witmer, J.A. and Schaffner, A. (2010) Statistics for the life sciences. United States: Pearson Education (US).

Field, A. (2013) Discovering statistics using IBM SPSS statistics. 4th edn. London: Sage Publications.

Course title: **Research project 1**:

Intended Students: MLS students at semester seven

Credit hour : 3(3+0)

**Course Objectives:**

The research project focuses on the synthesis of professional knowledge, skills, and attitudes in preparation for professional employment and lifelong learning. Students are trained to perform small research projects in one of the Medical laboratory areas that enable them to run experiments, collect data, review literature, obtain results and discuss their findings in the form of presentations.

Specific objectives:

The student should:

(1) Describe research methodology listing elements of research:

(2) Collect up to date information on a particular topic, using proper sampling techniques

(3) Execute a small research project and analyze obtained data.

(4) Discuss the significance of the results obtained and research conclusions.

(5) Write down a research paper.

(6) Present his findings in front of the class and discusses it with his colleagues and staff.

Assessment methods : Dissertation

|  |
| --- |
| **Semester Eight**  **Syllabus**  **(for all disciplines)** |

**Course Title Course Code:** Quality Management and Quality Assurance (MLS-MNG-482)

**Credit hours :** 2 Hours (2+0)

**Duration :** 15 weeks

**Disciplines involved :** All Disciplines of MLS

***Prerequisites:***

* Laboratory Safety.
* Statistics.

***Course contents***

The course discuss the role of laboratory management, The course is designed to provide the Student with Basics and Fundamentals in medical lab management.

***Rationale:***

Quality management is a philosophy aimed at integrating all organizational functions to focus on meeting customer needs and organizational objectives. It has been, with quality assurance, one of the most influential methods used in managing business processes. It has been incorporated as a vital component in the management systems of some of the world's most successful enterprises. The aim of this course is to equip participants to understand quality management and quality assurance so that they can make quality and continuous improvement work to best effect in their clinical laboratories, also develop in students the ability to plan and implement a TQM program, enable students to maintain an existing TQM program, and allow students to gain an insight into the various quality standards practiced by major organizations.

***Course out comes:***

***By the end of the course, students are expected to:***

1. Explain role of Total Quality Management in business and medical laboratories
2. Outline various schools of thoughts in Total Quality Management; Deming, Juran, Crusby, Ishilcawa and others.
3. Give an account on leadership and employee involvement and quality cycle.
4. Define and mention the tools for Continuous Improvement.
5. Outline customer satisfaction and performance measurement.
6. Outline Quality Function Deployment
7. Perform different protocols of quality controls in clinical laboratories.
8. Give an account on quality assurance inside and outside the clinical laboratories.
9. Describe different protocols of implementation of quality assurance.
10. List examples of pre-analytical, analytical and post-analytical variables that affect laboratory results and state how each is corrected.
11. Compare between internal and external quality control.
12. Define control material and state their use in the clinical laboratory.
13. Explain the need for control charts in clinical laboratory and describe how to enter data in a control chart.
14. List and explain the Westgard rules for interpretation of laboratory control data.
15. Apply the Westgard rules to actual control data and determine what action must be taken to correct out-of limit control values.
16. Define proficiency testing.
17. Outline six sigma processes.
18. Describe lean production process.
19. Give an account on ISO 9000 and ISO 1400 protocol for clinical laboratories.
20. Define Joint Committee for Traceability in Laboratory Medicine (JCTLA).

***Educational Strategies and Methods:***

1. Lectures.
2. Tutorial.
3. Group work.
4. Seminars

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %.
2. Final exam (Written Exam MCQs & structured questions : 70%

***Required Resources (in details):***

1. Lecture room.
2. Staff (Prof, Associate Prof. OR Assistant Prof).

***References:***

McClatchey, K.D., Alkan, S., Hackel, E., Keren, D.F. and Lew, K. (2001) Clinical laboratory medicine. [electronic resource]. 2nd edn. Philadelphia: Lippincott Williams & Wilkins,US.

Estridge, B.H. and Reynolds, A.P. (2011) Basic clinical laboratory techniques. 6th edn. Boston, MA, United States: CENGAGE Learning Custom Publishing.

Cheesbrough, M. (2006) District laboratory practice in tropical countries, part 2: Pt. 2. 2nd edn. Cambridge: Cambridge University Press.

**Course Title Course Code:** Medical Ethics & Professionalism (MLS-ETH-482)

**Credit hours :** 2 Hours (2+0)

**Duration :** 15 weeks

**Disciplines involved :** All Disciplines of MLS

***Prerequisites:***

-------

***Course contents:***

The course discuss the role of Medical Ethics & Professionalism, The course is designed to provide the Student with Basics and Fundamentals in medical ethics.

***Rationale:***

The study of Medical Ethics & Professionalism is essential for students in their daily practice and after graduation bypreparing candidates to recognize difficult situations and to deal with them in a rational and principled manner.

***Course out comes:***

***By the end of the course students are expected to:***

1. List major type of ethical conducts and misconducts.
2. Emphasize on the proper observation of ethical procedure while practicing in the laboratory.
3. Describe the role of ethics and professionalism in the appropriate conducts of a medical laboratory scientist in relation to his patients, colleagues and professions.
4. Discuss the general objective of equipping the students with all the basics elements in the fundamentals of medical ethics and professionalism.
5. Appreciation of the importance of ethics in research methodology and applied research methods.
6. Define the - Medical, Bio Clinical and research ethics.
7. Discuss the principle of Medical Ethics & Professionalism and also discuss national and international ethical guidelines, codes and declarations.
8. Discuss the role of medical ethics in relation to their profession, with practice and research emphasis in mind.
9. Identify the importance of ethics and how it governs the relationship of a medical laboratory scientist and the patients, colleague and the community at large.
10. Explain the ethical principles and fundamentals and their importance.
11. Overview the functions of Research Ethics Committee (REC) and Institutional Review Boards (IRB).
12. Perform quality control in the students’ daily practice, from ethical point of view.
13. Identify procedures and researches involving human subjects with emphasis on ethical conducts.

***Educational Strategies and Methods:***

1. Lectures.
2. Tutorial.
3. Group work.
4. Seminar.

***Evaluation and Assessment Methods (%):***

1. Continuous assessment 30 %
2. Final exam (Written Exam MCQs & structured questions : 70%

***Required Resources (in details):***

1. Lecture room.
2. Staff (Prof, Associate Prof. OR Assistant Prof).

***References:***

Houang, L., El-Nageh, M., Organization, W.H. and El-Nageh, M.M. (1993) Principles of management of health laboratories. Alexandria, Egypt: World Health Organization, Regional Office for the Eastern Mediterranean.

Baker, R.B. and McCullough, L.B. (eds.) (2008) The Cambridge world history of medical ethics: V. 1&2. Cambridge: Cambridge University Press.

English, V., Sommerville, A., Brannan, S. and Association, B.M. (2012) Medical ethics today: The BMA’s handbook of ethics and law. 3rd edn. London, United Kingdom: Wiley-Blackwell (an imprint of John Wiley & Sons Ltd).

Singer, P. (2011) Practical ethics. 3rd edn. New York: Cambridge University Press.

Singer, P.A. and Viens, A.M. (eds.) (2008) The Cambridge textbook of Bioethics. Cambridge: Cambridge University Press.

Course title: **Research project 2**:

**Disciplines involved :** All Disciplines of MLS

***Prerequisites:* Research project 1**

Credit hour : 3(3+0)

**Course Objectives:**

The research project focuses on the synthesis of professional knowledge, skills, and attitudes in preparation for professional employment and lifelong learning. Students are trained to perform small research projects in one of the Medical laboratory areas that enable them to run experiments, collect data, review literature, obtain results and discuss their findings in the form of presentations.

Specific objectives:

The student should:

(1) Describe research methodology listing elements of research:

(2) Collect up to date information on a particular topic, using proper sampling techniques

(3) Execute a small research project and analyze obtained data.

(4) Discuss the significance of the results obtained and research conclusions.

(5) Write down a research paper.

(6) Present his findings in front of the class and discusses it with his colleagues and staff.

Assessment methods : Dissertation

|  |
| --- |
| **Semester Seven**  **Syllabus**  **(Chemical Pathology)** |

**Course Title Course Code:** Instrumentation in Chemical Pathology (MLS-INS-475)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Chemical Pathology

***Prerequisites***

Math, physics

***Rationale***

The study of this course is of utmost importance since the needs for the most professional medical laboratory scientists require preparation through different levels of knowledge in instrumentation and laboratories equipments. The student should, therefore, understand the basics and advance techniques that are used in the clinical chemistry in the medical labs.

***Course contents:***

Course presents a description of the basics of automatic analysis of clinical analytical laboratories including technical study of the different apparatuses, their uses that includes the electronic principles of operating them and affecting the interpretation of results. This includes: Microscopes, Autoclaves, Ovens, Flame spectrophotometer, spectrophotometers, immunoflourescnce, fast adherence, interpreting mononucleosis test, Western blot test and interpreting the results, immunoblot analysis with care on patients specimens using automatic chemical analyzer, kinetic analyses of blood and other body fluids, immune diffusion osmotic measurement equipment, operating electrophoresis, ELISA and interpreting the results, PCR equipment and interpreting the obtained results, operating gas analyzers, Flowcytometry and chromatography The technologist should be aware to identify the equipment problem before starting the test and keep inventory of manufacturer and maintenance details for each equipment.

***Course out comes:***

***By the end of the course students are expected to:***

* Describe the importance of medical equipments in clinical chemistry lab.
* Understand the principles of different clinical chemistry labs instruments.
* Explain the types of laboratory methods used in clinical chemistry labs.
* Understand the basic concept of equipments used in clinical chemistry labs.
* Define the molecular techniques used in the medical labs.
* Describe the immunological techniques used in medical labs.
* Describe the techniques used in the assessment of the test result quality.

***Practical:***

1. Operation of colorimeter.
2. Operation of spectrophotometer.
3. Operation flame photometer.
4. Operation Ion selective electrode.
5. Operation of atomic absorption.
6. Operation of electrophoresis.
7. Operation of ELISA.
8. Operation of thin layer chromatography.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Burtis, C.A., Ashwood, E.R. and Bruns, D.E. (2005) Tietz textbook of clinical chemistry and molecular diagnostics. 4th edn. United Kingdom: Saunders (W.B.) Co.

Bishop, M.L., Fody, E.P. and Schoeff, L.E. (2013) Clinical chemistry: Principles, techniques, and correlations. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

**Course Title Course Code:** Quality Control in Chemical Pathology (MLS-QC-474)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Chemical Pathology

***Rationale***

Quality control is a philosophy aimed at integrating all organizational functions to focus on meeting customer needs and organizational objectives. It has been, with quality assurance, one of the most influential methods used in managing business processes. It has been incorporated as a vital component in the management systems of some of the world's most successful enterprises. The aim of this course is to equip participants to understand quality management and quality assurance so that they can make quality and continuous improvement work to best effect in their clinical laboratories, also develop in students the ability to plan and implement a TQM program, enable students to maintain an existing TQM program, and allow students to gain an insight into the various quality standards practiced by major organizations.

***Course contents:***

This course is designed to explain the purpose of the quality control program, Observe the documentation of results of calibration, performance, maintenance checks, malfunctions, and corrections. Arrive at the laboratory on time. Adhere to the established student uniform policy. Notify the clinical supervisor of any unavoidable absences prior to the scheduled arrival time and make arrangements to make up the time on a mutually convenient date. Demonstrate the ability to follow verbal and written instructions. Communicate in a constructive, professional manner (i.e. polite, considerate, pleasant and unhurried with members of the laboratory and hospital staff, peers and patients. Organize work in a logical sequence. Complete work and assignments within established deadlines. With the approval of the clinical instructor, demonstrate the initiative to perform tasks without being reminded. Demonstrate constructive utilization of all training time by examining available study materials during periods of time not devoted to instruction. Demonstrate flexibility in changes to the scheduled daily learning activities due to laboratory staffing, emergencies, etc. Demonstrate the ability to recognize and admit mistakes or discrepancies and take appropriate corrective measures, including seeking help and notifying staff when needed. Demonstrate the ability to accept professional constructive criticism regarding work and modified behavior appropriately. Maintain the confidentiality of all patient information when questioned by patients’ or other unauthorized individuals. Adhere to all published safety regulations in the laboratory. Demonstrate professionalism in attitude, appearance and work ethic 100% of the time. Adhere to standards and regulations regarding proper access and utilization of institutional computers. Adhere to policies of the affiliate regarding the use of ALL electronic devices, including but not limited to, portable music players such as MP3 and Smart/cell phones.

***Course out comes:***

***By the end of the course, students are expected to:***

1. Define quality.
2. Examine and critique the principles and practice of quality control.
3. Define quality assurance in clinical laboratories.
4. Define quality control in clinical chemistry.
5. Give an account on the importance of information technology in clinical chemistry.
6. Define and list the technical procedures used in quality control implementation in clinical chemistry.
7. Mention the quality control in clinical chemistry.
8. Outline the rules regulate the laboratory accreditation.
9. Give an account on new quality initiatives in clinical chemistry.
10. Comply with the standard operating procedure (SOP) for specimen handling, distribution, and storage including correct triage of specimen for in house and send out laboratory testing 100% of the time.
11. Demonstrate safe work practices following departmental protocol 100% of the time by the following
    1. Wearing personal protective equipment (PPE) as required.
    2. Handling and disposing of contaminated materials according to standard precautions.
    3. Handling chemicals or reagents according to safety procedures.
12. Dispose of waste according to laboratory protocol.
13. Recognize serum reference intervals and critical values for the following tests:

-Glucose and Blood urea nitrogen

-Total protein and Creatinine

-Sodium and Total bilirubin

-Potassium and Cholesterol

- Chloride and Therapeutic drugs (peak and trough)

-Blood gases and Troponin.

1. Identify all patient values that are significantly different (e.g. risk values, critical values, analytical errors) and bring these to the attention of the technologist immediately.
2. Determine need for repeat analysis on unacceptable reportable ranges.
3. Determine whether results fit the expected pattern with respect to previously obtained results on same test or other test results on same patient.
4. Evaluate a minimum of 10 patient result runs according to laboratory protocol including: routine, STAT, critical value, and phone results.
5. Perform and interpret 10 routine calculations to include anion gap, 24-hour urine, creatinine clearance and, LDL, with 100% accuracy.
6. Correlate laboratory data (normal and abnormal) to clinical conditions to the satisfaction of the clinical liaison.

***Practical:***

1. Duplication study.
2. Replication study.
3. Levey jining chart.
4. Cusum chart.
5. Recovery study.
6. Interference study.
7. Linearity.
8. Sensitivity.
9. STD curve.
10. Normal and pathological control sera.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Burtis, C.A., Ashwood, E.R. and Bruns, D.E. (2005) Tietz textbook of clinical chemistry and molecular diagnostics. 4th edn. United Kingdom: Saunders (W.B.) Co.

Bishop, M.L., Fody, E.P. and Schoeff, L.E. (2013) Clinical chemistry: Principles, techniques, and correlations. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

**Course Title Course Code:** Metabolic Diseases and Body Fluids (MMLS-CCHM-525)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Chemical Pathology

***Prerequisites:***

Physiology, Biochemistry.

***Rationale:***

Chemical pathology is the science deal with body fluids and chemical measurements in health and disease. The study of this course is importance since the needs for the most professional medical laboratory scientists require preparation through different levels of knowledge in clinical chemistry discipline.

***Course contents:***

This module offers a detailed study of the common measurement methods used in laboratories for carbohydrates, amino acids, proteins, lipids and their metabolism and disorders occurring in CHO, Proteins and lipids.

***Course out comes:***

***By the end of the course, students are expected to:***

1. Discuss the function and clinical significance of plasma proteins, the general causes of abnormal plasma protein concentrations.
2. . Describe and compare methodologies used in the analysis of plasma total protein and albumin.
3. List the Liver functions, and their clinical significances.
4. Discuss the general causes of abnormal serum protein concentrations.
5. Explain the principles of tests for the separation or fractionation of the different plasma proteins.
6. Identify the CHO metabolism and list different methods of blood glucose level estimation.
7. Diagnosis of lipids disorders (atherosclerosis, hyperlipidemia; it’s different types and causes)
8. Methods of analysis: estimation of: cholesterol, LDL, HDL and triglycerides by using: cholesterol oxidase method, precipitation technique and lipase method respectively.
9. Mention the metabolism and disorders of the Carbohydrates with the emphasis on diabetes Mellitus and methods used for screening, diagnosis, monitoring and the prognosis and follow up of diabetic patients by the measurement of Glucose in blood and urine specimens and protocol of the Glucose Tolerance Test (GTT).
10. Identify different fluid compartments in the body, the size of each, their composition and ways in which their sizes can be measured.
11. Describe the general characteristics and functions of CSF, Synovial, amniotic and peritoneal fluid.
12. List the various biochemical examinations for the CSF, Synovial, amniotic fluid and peritoneal fluid.
13. Describe the biochemical changes in CSF, Synovial, amniotic fluid and peritoneal fluid.
14. Explain how the CSF, Synovial, amniotic fluid and peritoneal fluid are formed and state where those processes occur.
15. Describe the methods used in an estimation of components in the CSF, Synovial, amniotic fluid and peritoneal fluid.

***Practical:***

1. Estimation of blood glucose in random sample.
2. Estimation of blood glucose in fasting, 2hour.
3. GTT normal curve.
4. GTT diabetic curve.
5. GTT of renal glucose uria.
6. HBA1C.
7. Microalbuminuria.
8. Estimation of cholesterol and triglyceride,
9. Estimation of lipoproteins.
10. Case study of diabetes.
11. Case study of dislipidemia.
12. Estimation of CSF glucose.
13. Estimation of CSF protein.
14. Detection of CSF globulins.
15. Assessment of amniotic fluid.
16. Case study of bacterial Meningitis.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room with multimedia.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Burtis, C.A., Ashwood, E.R. and Bruns, D.E. (2005) Tietz textbook of clinical chemistry and molecular diagnostics. 4th edn. United Kingdom: Saunders (W.B.) Co.

Bishop, M.L., Fody, E.P. and Schoeff, L.E. (2013) Clinical chemistry: Principles, techniques, and correlations. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

|  |
| --- |
| **Semester Eight**  **Syllabus**  **(Chemical Pathology)** |

**Course Title Course Code:** Biochemical Changes in Renal and GIT Diseases (MLS-GIT-484)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Chemical Pathology

***Prerequisites:***

Physiology, Biochemistry.

***Rationale:***

Study of Renal Diseases is to educate and train technicians as skilled medical laboratory technologists and to generate new knowledge in the biomedical and Health Services.

***Course out comes:***

***By the end of the course students are expected to:***

1. Study of renal function including urine chemical & physical properties.
2. Identify renal system including physical properties of urine (PH – specific gravity – odor –color), chemical properties of urine including detection of reducing substances – ketone bodies – urine protein – bile pigment.
3. List the electrolytes compartments of total body water and homeostatic regulation of sodium, potassium, and body water
4. Explain the blood-buffering mechanism of the bicarbonate and hemoglobin buffering systems.
5. Define various states of decreased or increased plasma electrolyte concentration in term of excess or deficit of water or electrolyte, and discuss the role of the kidney in electrolyte excretion and consternation in a healthy individual.
6. Describe the principles involved in the measurement of pH, PCO2, and PO2; list the problems and precautions in collecting and handling samples for patients and blood gas analysis.
7. Explain acid-base balance regulation by the kidney with respect to the following: hydrogen ion excretion, bicarbonate ion reaction, sodium – hydrogen exchange and ammonium secretion.
8. Identify some common cases of metabolic acidosis and alkalosis and compensate (kidney and lungs) for the various conditions.
9. Discuss the clinical significance of osmolality.
10. Discuss the clinical significance of non protein nitrogenous substances.
11. Understand gastrointestinal tract disorders and investigations of GIT disorders including GIT enzymes.
12. Demonstrate the clinical enzymology including the salivary glands and pancreatic enzymes and liver enzymes.
13. Demonstrate gastrointestinal function by doing analysis of pancreatic amylase, lipase, bicarbonate, xylose absorption, and occult blood.
14. Diagnosis of Pathological condition associated with gastrointestinal tract include: malabsorption, and Nutritional disorders.
15. Identify GIT including introduction, enzymes and hormones of GIT, disorders including pancreatitis and malabsorption and how to assess them.
16. Describe what blood tests are checked to evaluate patients with liver disease or with suspected liver disease.
17. Understand the serum protein tests, enzyme tests, and immunological tests that are used in the evaluation of liver disease.
18. Understand conjugated and unconjugated bilirubin.
19. Understand the importance of the prothrombin time and albumin in the assessment of hepatic synthetic function.
20. Evaluation of Jaundice and Hepatic Enlargement
21. Evaluation of Cirrhosis: mixed hepatocellular disease and “infiltration” by scar tissue (many types); consequence of chronic liver disease
22. Intrahepatic cholestasis: drug effect, primary biliary cirrhosis
23. Identify abnormalities of bilirubin metabolism.

***Practical:***

1. Urine analysis (Qualitative).
2. Urine analysis (Quantitative).
3. Estimation of blood urea
4. Estimation of serum creatinine.
5. Creatinine clearance (Crcl).
6. Estimation of sodium and potassium.
7. Estimation of Calcium and phosphorus.
8. Case study of acute renal failure and chronic renal failure.
9. Case study of nephritic syndrome.
10. Case study of glomerular nephritis.
11. Case study of renal tubular acidosis.
12. Case study of acid –base balance.
13. Estimation of plasma protein.
14. Estimation of serum albumin.
15. Liver function tests profile.
16. Case study of hepatitis.
17. Case study of alcoholic liver disease.
18. Case study of obstructive jaundice.
19. Case study of hemolytic jaundice.
20. Case study of malabsorption.
21. Case study of pancreatitis.

***Educational Strategies and Methods:***

* 1. Lecture
  2. Tutorial
  3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Burtis, C.A., Ashwood, E.R. and Bruns, D.E. (2005) Tietz textbook of clinical chemistry and molecular diagnostics. 4th edn. United Kingdom: Saunders (W.B.) Co.

Bishop, M.L., Fody, E.P. and Schoeff, L.E. (2013) Clinical chemistry: Principles, techniques, and correlations. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

**Course Title Course Code:** Endocrinology and Enzymology (MLS-ENZ-485)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Chemical Pathology

***Prerequisites:***

Physiology, Biochemistry.

***Rationale:***

Chemical pathology is the science deal with body fluids and chemical measurements in health and disease. The study of this course is importance since the needs for the most professional medical laboratory scientists require preparation through different levels of knowledge in clinical chemistry discipline.

## *Course outcomes:*

***By the end of the course students are expected to:***

1. Define and classify Enzymes and the usage of enzymes in diagnosis of different diseases.
2. Give an account on clinical Enzymology with the emphasis of enzymes used for diagnosis of liver diseases (AST, ALT, ALP and GGT).
3. Give an account on clinical Enzymology with the emphasis of enzymes used for diagnosis of Cardiac diseases (CPK, CK-MB, AST, LDH) and disease correlation in Acute Myocardial Infarction (AMI).
4. Describe the usage of enzymes as reagents (Urease, Glucose Oxidase).
5. Outline the usage of enzymes as Tumor Markers (Prostatic ACP).
6. Demonstration of clinical enzymology including the study liver enzymes and cardiac enzymes.
7. Study and demonstrate clinical enzymology including hydrolase, amylase, nucleotidase, trypsin, and pepsin.
8. Study of endocrine system functions, hormones methods of extraction from biological fluids.
9. Use of instruments in clinical chemistry and estimation of hormones.
10. Identify some common cases of hormonal disorders.
11. Discuss the clinical significance of hyper and hypo secretion of hormones.

***Practical:***

1. Measurement of AST and ALT.
2. Measurement of ALP.
3. Measurement of alpha amylase.
4. Measurement of CK (total CK-MB).
5. Measurement of Troponin.
6. Measurement of LDH.
7. Measurement of thyroid hormones.
8. Measurement of fertility hormones.
9. Detection of HCG.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Burtis, C.A., Ashwood, E.R. and Bruns, D.E. (2005) Tietz textbook of clinical chemistry and molecular diagnostics. 4th edn. United Kingdom: Saunders (W.B.) Co.

Bishop, M.L., Fody, E.P. and Schoeff, L.E. (2013) Clinical chemistry: Principles, techniques, and correlations. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

**Course Title Course Code:** Advanced Chemical Pathology (MLS-ACHM-486)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15weeks

**Disciplines involved :** Chemical Pathology

***Prerequisites:***

Physiology, Biochemistry.

***Rationale:***

Poisoning and the knowledge of [poisons](http://sis.nlm.nih.gov/enviro/iupacglossary/glossaryp.html#poison) have a long and colorful history although the science of toxicology has only recently come into existence as a distinct discipline. Even the cave dwellers had some knowledge of the adverse effects of a variety of naturally occurring substances, knowledge that they used in hunting and in warfare.

## *Course Ccontents:*

Toxicology is relatively new as a distinct scientific discipline although many of its basic principles have been known for some time. This section will explore this history, describe how toxicology has changed over time, and offer a broad definition of this discipline. In addition, the six areas of applied toxicology will be described as well as how these areas are relevant to our daily lives. The application of certain basic principles of switching and logic system design in electronic telephone switching systems is illustrated in an outline description of a fully-solid-state switching system for exchanges having some 10 000 lines and 1000 junctions. Speech transmission is ensured on a one-wire time-multiplex p.a.m. basis using the principle of resonant transfer between modem circuits.

## *Course outcomes:*

***By the end of the course, students are expected to:***

1. Define toxicology
2. Identify the six applied areas of toxicology.
3. Explain ways in which toxicology is relevant to our daily lives Outline the basic principles of toxicology.y
4. Define dose and contrast the types of dose measures.
5. Distinguish how each type of dose is measured.
6. Be able to develop a therapeutic drug monitoring plan.
7. Measure aminoglycosides with or without serum concentration time data.
8. Make appropriate decisions as to the need for therapeutic drug monitoring
9. Identify situations appropriate for series or peak/trough pharmacokinetic monitoring.
10. Be able to identify appropriate peak and trough concentrations for conventional and single daily dosing strategies.
11. Be able to develop a plan to monitor the patient for successful resolution of infection or the development of adverse drug reactions to the aminoglycoside.
12. Explain the concept of dose-response
13. Identify some common cases of metabolic acidosis and alkalosis and compensate (kidney and lungs) for the various conditions.
14. Describe the concept of dose-effect.
15. Define the following terms:

a. Cancer

b. Carcinogen

c. Metastasis

d. Tumor marker

e. Eutopic hormone production

f. Ectopic hormone production

1. Explain the role of tumor markers in cancer management.
2. Identify the characteristics or properties of an ideal tumor marker.
3. . Discuss the clinical application of the following tumor markers:

a. Prostrate-specific antigen (PSA)

b. Human chorionic gonadotropin (hCG)

c. Alpha-fetoprotein (AFP)

d. Carcinoembryonic antigen (CEA)

e. CA 125

f. CA 19-9

g. CA 15-3

19- Discuss clinical applications of Molecular Diagnostic techniques for breast, ovarian and colon cancers.

1. Define vitamins.
2. Classify the different types of vitamins.
3. Describe the metabolism of vitamins.
4. List the disorders in vitamins level in the blood.
5. Understand the role of vitamins and principles of it is estimation and
   1. Classification
6. Describe and perform quantitative measurements of vitamins in clinical chemistry in order to diagnosis different pathological disorders.
7. Define trace elements.
8. Classify the different types of trace elements.
9. Understand the trace elements metabolism and disorders and methods used for diagnosis of them.
10. Describe the metabolism of trace elements.
11. List the disorders in trace elements level in the blood.
12. Understand the role of trace elements and principles of it is estimation and
    1. Classification
13. Describe and perform quantitative measurements of trace elements in clinical chemistry in order to diagnosis different pathological disorders.

Mention the methods use in assessment for nutrition.

1. Define the pregnancy and terminology related to it.
2. Identify the physiology of pregnancy.
3. Describe the signs and symptoms of pregnancy.
4. List the trimesters of pregnancy and biochemical changes during it.
5. Describe the routine and special laboratory tests should be done in pregnancy.
6. Identify the physical examination of the newborn.
7. Identify newborn hearing screening tests.
8. Describe the newborn blood spot (heel prick) tests.
9. Describe the screening for premature babies.
10. List the different types of screening tests for neonates.
11. Recognize the signs and symptoms that are suggestive of an inborn error of metabolism.
12. Describe the characteristics of different classes of metabolic syndromes.
13. Formulate a logical diagnostic approach to determining which specific condition is present when an inborn error of metabolism is suspected.
14. Delineate the value and scope of newborn screening programs.

***Practical:***

1. Use of Gas chromatography .HPLC, THC in detection of drug abuse.
2. Monitoring test of :

-Dejoxin

-Paracetamol

-Cyclosporine

1. Measurement of vitamin C.
2. Measurement of vitamin D.
3. Measurement of vitamin E.
4. Measurement of Zinc and copper.
5. Measurement of iron profile.
6. Measurement of magnesium
7. Screening tests of neonates.
8. Case of GDM.
9. Case of hypertension in pregnant women.
10. Urine analysis for pregnant urine.
11. GTT curve for pregnant women.
12. Estimation of electrolytes in pregnant women (Na, K, Ca).
13. Albumin, renal function tests on pregnant women.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Burtis, C.A., Ashwood, E.R. and Bruns, D.E. (2005) Tietz textbook of clinical chemistry and molecular diagnostics. 4th edn. United Kingdom: Saunders (W.B.) Co.

Bishop, M.L., Fody, E.P. and Schoeff, L.E. (2013) Clinical chemistry: Principles, techniques, and correlations. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

|  |
| --- |
| **Semester Seven**  **Syllabus**  **(Hematology and Immunhematology)** |

**Course title** Leukaemias and Lymphomas Investigations

**Course symbols and numbers:** MLS-LEU-475

**Duration and credits:** 15 weeks

**Intended Students:**  laboratory science students, year 4, semester 7

**Prerequisites:** Basic hematology course MLT-HEM-214 and Advanced Haematology course (MLT-HEM-317)

## Outline:

This is a Four-week block, during which the students are introduced to the study of haematological malignancies including their causes, lab. diagnosis and follow-up with the application of the most up-to-date techniques available.

## Rationale:

Haematological malignancies are among the most common malignant disorders. Basic lab. procedures in addition to immunological, cytochemical, cytogenetics and molecular techniques are important tools for diagnosing and monitoring of leukaemias and lymphomas, therefore students have to be well acquainted with such procedure.

## General objective:

The overall aim of this course is to perform laboratory diagnosis of different types of the haematological malignancies and all the relevant investigations intended to determine proper diagnosis and response to treatment.

## Specific objectives

## *By the end of this course the student is expected to*:

1. Classify haematological malignancies using the international classification systems.

2- Perform basic haematological tests intended to leukaemia diagnosis.

3- Perform advanced investigations using immunological, cytogenetic and molecular techniques.

4- Determine the patients' response to treatment through appropriate lab. procedures.

5- Participate in medical research aiming at comprehensively studying leukaemias and lymphomas.

**Course contents**

1- The aetiology and genetics of haematological malignancies

2- Classification of haematological malignancies

3- Acute myeloid leukaemia

4- Acute lymphatic leukaemia

5- Chronic myeloid leukaemia

6- Chronic Lymphatic leukaemia (B-cell &T-cell diseases)

7- Myelodysplastic syndromes (MDS)

8- Lymphomas

8.1- Hodgkin's lymphoma

8.2- Non-hodgkin's lymphoma

9- Multiple myeloma

10- Myeloproliferative disorders

10.1-Polycythaemia

10.2- Essential thrombocythaemia

10.3- Myelofibrosis

**Educational strategies:**

1-Lectures: power point presentations of the main topics.

2-Practicals: In all basic haematological techniques and lab diagnosis of blood abnormalities related to leukaemias.

3- Tutorials.

**Evaluation and assessment methods:**

Tutorials and seminars % 10

Med course % 40

Final exam % 40

**Required resources:**

Staff members: 4 laboratory scientists

Lecture room: For 20 students

Laboratory: For 20 students

**Reference**s:

- Essential hematology, Hoffbrand+Moss+Petti, Blackwell 978-1405136495

- Anemias, WHO,Bruce,Evatt,Wiliam

- Dacie and Lewis Practical hematology Lewis+Bair+Bstes,Church 978-0443066603.

- Hematology at a glance 978-1405136495.

- District laboratory practice in tropical countries part 1 978-0521676328

- Atlas of clinical hematology 971-0721670027

- Wintrobe's Clinical Hematology, 11th Ed

by John P. Greer (Editor), John Foerster (Editor), John N. Lukens (Editor)

Publisher: Lippincott Williams & Wilkins Publishers; 11th edition (December 2003)

**Course Title Course Code:** Bleeding and thrombotic Disorders (MLS-HOM-476)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Hematology and Immunohematology

***Prerequisites:*** Molecular and cell biology

## *Course contents:*

This is a four-week block, during which the students are lead to comprehensive study of the bleeding and coagulation disorders and the investigations intended to diagnose and monitor these cases.

## *Rationale:*

Bleeding and thrombosis are life-threatening disorders that need close medical supervision. Diagnosis of these disorders necessitates application of up-to-date laboratory techniques which are also used to monitor the anticoagulant therapy.

## *General objective:*

This course aims at studying the bleeding and coagulation disorders and their lab diagnosis in addition to follow-up of treatment.

***Course out comes:***

***By the end of this course the student is expected to***:

1- Classify the bleeding disorders.

2- Classify the coagulation disorders.

3- Perform investigations intended to monitoring of the anticoagulant therapy.

4- Perform haemophilia investigations and determine the relevant doses of the deficient factor.

5- Diagnose and monitor DIC.

***Practical:***

1. PT + APTT +TT.
2. Factor assay.
3. Assay of coagulation factors.
4. D-dimer tests+ case study.
5. Lab. Assessment of Platelets.
6. Detection of FDPs.
7. Lab. Control of thrombolytic therapy.

***Educational Strategies and Methods:***

1. Lectures.
2. Practical sessions
3. Tutorial.
4. Group work.
5. Seminars

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Laboratory
3. Staff (Prof, Associate Prof. OR Assistant Prof).
4. Lab. practical staff.

***References:***

Hoffbrand, V. and Moss, P.A.H. (2015) Hoffbrand’s essential Haematology. Hoboken, NJ, United States: John Wiley & Sons.

Bain, B.J., Bates, I., Laffan, M.A. and Dacie, J.V. (2011) Dacie and Lewis practical Haematology: Expert consult: Online and print. 11th edn. Edinburgh: Elsevier Churchill Livingstone.

Mehta, A.B., Hoffbrand, V.A. and Hoffbr, V.A. (2005) Haematology at a glance. 2nd edn. Malden, MA: Blackwell Publishing.

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

Heilmeyer, L. and Begemann, H. (2004) Atlas of clinical Hematology. Edited by Helmut Loffler, Johann Rastetter, and Torsten Haferlach. 6th edn. Berlin, Germany: Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

Course title: Anaemias and Haemoglobin Disorders MLS-ANE-474

Duration and credits 15 weeks

Intended Students: Laboratory science students, year 4, semester 7

Prerequisites: Basic hematology course MLT-HEM-214 and Advanced

## Outline

This is a Four-week block, during which the students are introduced to extensive study of different types of anaemias their etiology, pathophysiology and diagnosis.

## Rationale:

## Anaemias are haematological disorders that have serious implications on both the individual and community levels. Therefore, proper diagnosis of anaemias is important since treatment is based on clear laboratory evidence that needs application of basic and sophisticated techniques.

**General objectives:-**

## The overall aim of this course is to perform laboratory diagnosis of different types of anaemias and all the relevant investigations intended to determine response to treatment. .

## Specific objectives:-

**By the end of this course the students are expected to**

T o perform the basic and the more advanced investigations used for diagnosis of anaemias

Classify different types of anaemias based on the lab. findings and clinical information.

Do various tests intended to follow-up the patients during and post-treatment.

Offer genetic counseling to the families with members suffering from inherited anaemias.

Participate in community-based health education activities concerning anaemias.

**Course contents:**

**1-** Erythropoiesis, RBCs breakdown, Hb synthesis and RBCs physiology

2- Microcytic hypochromic anaemias

2.1- Iron deficiency anaemia

2.2- Sideroblastic anaemia

2.3- Anaemia due to chronic disorders

3- Macrocytic anaemias

3.1- Megaloblastic anaemias

3.2- Non-megaloblastic anaemias

4- Inherited haemolytic anaemias

4.1- Anaemias due to Hb defect

4.1.1- Qualitative Hb defect:

- Sickle cell anaemia

- Hb C disease and other haemoglobinopathies

4.1.2- Quantitative Hb defect

- α-Thalassaemia

- β-Thalassaemia

4.2- Anaemias due RBC membrane defect

4.2.1- Hereditary spherocytosis

4.2.2- Hereditary elleptocytosis

4.3- Red cell metabolic defect anaemias

4.3.1- G6PD deficiency anaemia

4.3.2- Pyruvate kinase deficiency anaemia

5- Acquired haemolytic anaemias

5.1- Auto-immune haemolytic anaemias

5.1.1- Cold reactive auto-immune H.A.

5.1.2- Warm reactive auto-immune H.A.

5.2- Allo-immune H.A.

- Haemolytic Disease of the Newborn

5.3- Non-immune haemolytic anaemias

5.4- Paroxysmal Nocturnal Hemoglobinuria (PNH)

6. Aplastic anaemia and bone marrow failure

6.1- Aplastic anaemia

6.2- Red cell aplasia

6.3- Congenital dyserythropoietic anaemia

**Educational strategies:**

1-Lectures: power point presentations of the main topics.

2-Practicals: Practicals in all haematological tequniches applied to diagnosis and follow-up of anaemias.

3- Tutorials.

4- Self instructional units.

5- Group discussions

6-Assignments and reports

**Evaluation and assessment methods:**

Tutorials: % 10

Mid course exam: % 40

Final exam: % 40

**Required resources**

Staff members: 2 laboratory scientists

Lecture room: For 20 students

Laboratory: For 20 students

**References:**

Essential hematology, Hoffbrand+Moss+Petti, Blackwell 978-1405136495

Anemias, WHO,Bruce,Evatt,Wiliam

Dacie and Lewis Practical hematology Lewis+Bair+Bstes,Church 978-0443066603

Hematology at a glance 978-1405136495

District laboratory practice in tropical countries part 1 978-0521676328

Laboratory mathematics 978-0815113973

Atlas of clinical hematology 971-0721670027

Hematology at a glance 971-1405126663

**Course Title Course Code:** Quality Assurance in Hematology (MLS-QAH-485)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Hematology and Immunohematology

## *Course contents:*

This is course, during which the students study the general specific aspects of quality assurance and the quality control in hematology lab.

## *Rationale:*

Quality assurance concerns with the guarantee of accuracy of the lab results and maintenance of the equipment used, therefore knowledge of quality procedures is complementary to laboratory and clinical sciences.

## *General objective:*

The overall aim of this course is to study the different steps of quality control in- and out- of the lab ending-up with accurate results that are correctly interpreted.

## *Course outcomes:*

***By the end of this course the student is expected to***:

1. Outline the general aspects of quality assurance.

2- Define different terms related to quality assurance and quality control.

3- Structure quality control charts and tables.

4- Read results using quality control charts and tables.

5- Determine the reference ranges for different parameters.

6- Apply safety procedures in hematology laboratory.

***Practical:***

1. Lab. Design.
2. Levey Jinning chart.
3. Lab. Statistics.
4. Preparation of Hb STD.
5. Case study.

***Educational Strategies and Methods:***

1. Lectures.
2. Practical sessions
3. Tutorial.
4. Group work.
5. Seminars

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%

Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Laboratory
3. Staff (Prof, Associate Prof. OR Assistant Prof).
4. Lab. practical staff (MSc)

***References:***

Hoffbrand, V. and Moss, P.A.H. (2015) Hoffbrand’s essential Haematology. Hoboken, NJ, United States: John Wiley & Sons.

Bain, B.J., Bates, I., Laffan, M.A. and Dacie, J.V. (2011) Dacie and Lewis practical Haematology: Expert consult: Online and print. 11th edn. Edinburgh: Elsevier Churchill Livingstone.

Mehta, A.B., Hoffbrand, V.A. and Hoffbr, V.A. (2005) Haematology at a glance. 2nd edn. Malden, MA: Blackwell Publishing.

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

Heilmeyer, L. and Begemann, H. (2004) Atlas of clinical Hematology. Edited by Helmut Loffler, Johann Rastetter, and Torsten Haferlach. 6th edn. Berlin, Germany: Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

Medicine, D. of, Pediatrics, D. of H., Chair, V., Stanford, Anatomic, D. of, Services, C.P., Pathology, S., List, A.F., Member, S., Hematology, M., CEO, M.C.C., Florida, T., Means, R.T., Medicine, I., Paraskevas, F., Immunology, R., Rodgers, G.M., Pathology, U., Center, H.S., Director, M., Laboratory, C., Laboratories, A., City, S.L., Emeritus, J.F. and Emertius, P. (2013) Wintrobe’s clinical hematology. Edited by John P. Greer, Daniel A. Arber, and Bertil E. Glader. 13th edn. Philadelphia, PA, United States: Lippincott Williams and Wilkins

**Course Title Course Code:** Immunohematology and Blood Bank (MLS- IMMH -484)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Hematology and Immunohematology

## *Course contents:*

This is a 6-week course, during which the students study the molecular, biochemical bases, detection methods of blood group antigens and hemopoietic stem cell biology. Besides, students have to perform the compatibility tests prior to blood transfusion, bone marrow and solid organ transplantation.

## *Rationale:*

Blood transfusion and bone marrow transplantation are life-saving procedures that are used in treatment of anemias, hematological malignancies and other medical emergencies.

## *General objective:*

The overall aim of this course is to determine the red cells, leukocytes and platelets antigens and antibodies and check for the blood and histo compatibility by performing tests based on the antigen-antibody reaction patterns.

## *Course out comes:*

***By the end of this course the student is expected to***:

1. Mention the structure and functions of different type’s antibodies.

2- Mention biochemistry and patterns of inheritance of blood group antigens.

3- Determine the presence of different antigens and antibodies.

4- Perform the lab tests that determine blood and tissue compatibility.

5- Obtain and transfuse different components of blood.

6- Control the quality of antigen and antibody reactions.

***Practical:***

1. Stem cell isolation1.
2. Stem cell isolation2.
3. Problem solving.
4. HLA typing.
5. Case study.

***Educational Strategies and Methods:***

1. Lectures.
2. Practical sessions
3. Tutorial.
4. Group work.
5. Seminars

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Laboratory
3. Staff (Prof, Associate Prof. OR Assistant Prof ).
4. Lab. practical staff (MSc)

***References:***

Hoffbrand, V. and Moss, P.A.H. (2015) Hoffbrand’s essential Haematology. Hoboken, NJ, United States: John Wiley & Sons.

Bain, B.J., Bates, I., Laffan, M.A. and Dacie, J.V. (2011) Dacie and Lewis practical Haematology: Expert consult: Online and print. 11th edn. Edinburgh: Elsevier Churchill Livingstone.

Mehta, A.B., Hoffbrand, V.A. and Hoffbr, V.A. (2005) Haematology at a glance. 2nd edn. Malden, MA: Blackwell Publishing.

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

Heilmeyer, L. and Begemann, H. (2004) Atlas of clinical Hematology. Edited by Helmut Loffler, Johann Rastetter, and Torsten Haferlach. 6th edn. Berlin, Germany: Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

Medicine, D. of, Pediatrics, D. of H., Chair, V., Stanford, Anatomic, D. of, Services, C.P., Pathology, S., List, A.F., Member, S., Hematology, M., CEO, M.C.C., Florida, T., Means, R.T., Medicine, I., Paraskevas, F., Immunology, R., Rodgers, G.M., Pathology, U., Center, H.S., Director, M., Laboratory, C., Laboratories, A., City, S.L., Emeritus, J.F. and Emertius, P. (2013) Wintrobe’s clinical hematology. Edited by John P. Greer, Daniel A. Arber, and Bertil E. Glader. 13th edn. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

**Course Title Course Code:**  Advanced Techniques in Hematology (MLS-AHEM-486)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Hematology and Immunohematology.

## *Course contents:*

This is a 3 week course, during which the students study the principles of cells counters and the use and maintenance of automatic machines used in hematology lab.

## *Rationale:*

## Use of automation in hematology laboratory is very important for the accuracy of the result and to minimize the time spent in processing the specimens. It also increases the cost-effectiveness of the lab procedures.

## *General objective:*

The overall aim of this course is to study operation, maintenance and control of the automatic devices used in hematology laboratory.

## *Course outcomes:*

***By the end of this course, the student is expected to***:

1. List the principles of the automatic cell counters.
2. Mention the principle of coagulmeters .
3. Outline the principles of flowcytometry.
4. Operate the automatic cell counters.
5. Operate the flowcytometer.
6. Interpret the results obtained by the automatic machines.
7. Mention changes on blood caused by HIV and other viruses.
8. List effects of the malaria parasite on the red cells.
9. Mention the relationship between some infectious agents and hematological malignancies.
10. Correlate between some anemias and parasitic infections such as malaria, schistosomiasis and other infections.
11. Perform investigations that lead to diagnosis of the hematological changes due systemic disorders.
12. Mention hematological changes in infants.
13. Mention hematological changes in older people.
14. Determine hematological manifestations of pregnancy.
15. Perform specific investigations to diagnose hematological disorders in these populations.
16. Interpret the test results based on the reference ranges set for these populations.

***Practical:***

1. Operation of cell counters.
2. Operation of cell counters.
3. Automated cell counting (1).
4. Automated cell counting (2).
5. Gel technique.
6. Operation of automatic coagulometers.
7. Case study.
8. Case study.
9. Case study.
10. Case study.
11. Case study.
12. Case study.
13. Case study.
14. Case study.
15. Case study.

***Educational Strategies and Methods:***

1. Lectures.
2. Practical sessions
3. Tutorial.
4. Group work.
5. Seminars

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Laboratory
3. Staff (Prof, Associate Prof. or Assistant Prof).
4. Lab. practical staff (MSc).

***References:***

Hoffbrand, V. and Moss, P.A.H. (2015) Hoffbrand’s essential Haematology. Hoboken, NJ, United States: John Wiley & Sons.

Bain, B.J., Bates, I., Laffan, M.A. and Dacie, J.V. (2011) Dacie and Lewis practical Haematology: Expert consult: Online and print. 11th edn. Edinburgh: Elsevier Churchill Livingstone.

Mehta, A.B., Hoffbrand, V.A. and Hoffbr, V.A. (2005) Haematology at a glance. 2nd edn. Malden, MA: Blackwell Publishing.

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

Heilmeyer, L. and Begemann, H. (2004) Atlas of clinical Hematology. Edited by Helmut Loffler, Johann Rastetter, and Torsten Haferlach. 6th edn. Berlin, Germany: Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

Medicine, D. of, Pediatrics, D. of H., Chair, V., Stanford, Anatomic, D. of, Services, C.P., Pathology, S., List, A.F., Member, S., Hematology, M., CEO, M.C.C., Florida, T., Means, R.T., Medicine, I., Paraskevas, F., Immunology, R., Rodgers, G.M., Pathology, U., Center, H.S., Director, M., Laboratory, C., Laboratories, A., City, S.L., Emeritus, J.F. and Emertius, P. (2013) Wintrobe’s clinical hematology. Edited by John P. Greer, Daniel A. Arber, and Bertil E. Glader. 13th edn. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

|  |
| --- |
| **Semester Seven**  **Syllabus**  **(Microbiology)** |

**Course Title Course Code:** Medical Bacteriology (MLS-BAC-474)

**Credit hours :** 3(2+1)

**Duration :** 15 weeks

**Disciplines involved :** Microbiology

***Prerequisites:***

Immunology

## *Rationale:*

The basic principles of general General microbiology is very important to understand the nature of microorganisms , structure ,methods of nutrition,type of metabolism which facilitate understanding of pathogenesis and pathogenisty of pathogens.

## *Course contents:*

This course provides students information about the history of microbiology, taxonomy, growth, metabolism types of bacteria; as well as bacterial cell structure and physiology and also basic methods use for isolation and identification of bacteria as well as methods sterilization and disinfection.

## *Course out comes:*

***By the end of the course, students are expected to:***

1. Discuss the discovery of microbial world, history of microbiology and contribution of famous scientists such as Antonie Leeuwenhoek, Joseph Lister, Paul Ehrlich, Louis Pasteur, Robert Koch, Martinus Beijerinck, Sergei Winogradsky, and Alexander Fleming.
2. Describe the History of microbiology in sudan.
3. Describe the origin of life and spontaneous generation controversy, as well as current thoughts on microbial evolution and scope and relevance of microbiology.
4. Define the modern trends in the classification of microbial world including molecular taxonomy, numerical taxonomy, Bergey’s classification, and general characters of major groups of eubacteria.
5. Describe the morphology and ultrastructure of bacteria, regarding size, shape arrangement, structure, and chemical composition of bacteria.
6. Define the nutritional requirements of major groups of microbes, the nutritional uptake, the cellular transport methods, and the translocation of iron uptake.

*Practical:*

1. Audiovisual demonstration of bacterial structure and classification.
2. Staining technique2: ZN stain, Aueramine stain, spore stain.
3. Culture media types and preparation
4. Biochemical test types and methods 1
5. Biochemical test types and methods 2
6. Serological methods of bacterial identification
7. Susceptibility test 2
8. Methods of inoculation and incubation
9. Methods of sterilization
10. Methods of disinfection
11. Serological methods in bacterial infection diagnosis
12. Susceptibility test 1

***Educational Strategies and Methods:***

* 1. Lecture
  2. Tutorial
  3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Forbes, B.A., Sahm, D.F., Weissfeld, A.S., Photography, E.T.A. and Tille, P. (2013) Bailey & Scott’s diagnostic microbiology. 12th edn. United States: Elsevier, Mosby.

Collee, J.G., Fraser, A.G., Marmion, B.P. and Simmons, A. (1996) Mackie & McCartney practical medical microbiology. 14th edn. New York: Churchill Livingstone.

Murray, P.R., Rosenthal, K.S. and Pfaller, M.A. (2015) Medical microbiology. Philadelphia, PA, United States: Elsevier Science Publishing Co.

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

**Course Title Course Code:**  Virology (MLS-VIR-476)

**Credit hours :** 3(2+1)

**Duration :** 16 weeks

**Disciplines involved :** Microbiology

***Prerequisites:***

General Microbiology.

***Rationale:***

Studying the routes of infection is important for disease control and prophylaxis.

## *Course contents:*

This course will enable the students to know the definition, morphology, structure, replication, classification, and ways of causing disease of different viruses. The type of specimens taken for laboratory diagnosis and methods for isolation of viruses (cell cultures, electron microscopy, and serological and molecular tests.

## *Course out comes:*

***By the end of the course, students are expected to:***

1. Discuss the History and principles of virology
2. Define the Virus structure and morphology
3. Determine Cellular receptors and virus entry
4. Identify the Virus morphogenesis and mechanism of host cell damage
5. Discuss viral replication General strategies, replication of plus stranded RNA virus, negative strand RNA viruses, viral replication General strategies, replication of plus stranded RNA virus, negative strand RNA viruses.
6. Discuss the Replication of double stranded DNA viruses (SV40, pox), ssDNA. Prion proteins, replication of plant virus
7. Define methods of Specimens collection and transportation.
8. Principles of bio-safety, containment facilities, maintenance and handling of laboratory animals and requirements of virological laboratory.
9. Discuss the direct and indirect methods for detection of viruses
10. Discuss the different types of cell culture and their components
11. Define the methods of inoculation and incubation of cell culture media.
12. Identify the different methods of viruses cultivation
13. Discuss thee emoryonated egg and animal inculcation methods
14. Identify the method for detection of viruses growth in cell culture(CPE, ect
15. Define the Electron microscope structure and function.
16. Determine the role of antigen and antibody detection methods in direct and indirect detection of viruses
17. Define the role of different molecular diagnostic techniques in diagnosis of viruses
18. . Discuss antintiviral susceptibility tests,
19. Determine the methods of sub-typing and genomic analysis of viruses,
20. Define the respiratory viruses, diagnostic methods,
21. Detection of specific respiratory viruses and clinical syndromes.
22. Define different types of Viral Vaccines
23. Determine the Antivirals drugs: Interferons, designing and screening for antivirals, mechanisms of action, antiviral libraries, antiretrovirals—mechanism of action and drug resistance.

***Practical:***

1. Demonstration of virology lab facilities.  
   Serological test for viral infection 1: haemoaglutination and compelement fixation test.
2. Serological test for viral infection 2: ELISA 1.
3. Serological test for viral infection 3: ELISA 2.
4. Serological test for viral infection 4; IFA.
5. Serological test for viral infection 5; ICT.
6. Virus isolation techniques 1:Cell culture lab equipment and facilities

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Flint, J.S., Racaniello, V.R. and Rall, G.F. (2015) Principles of Virology: Volume 1: Molecular biology. United States: Science Publishers,U.S.

Murray, P.R., Rosenthal, K.S. and Pfaller, M.A. (2015) Medical microbiology. Philadelphia, PA, United States: Elsevier Science Publishing Co.

White, D.O. and Fenner, F.J. (1994) Medical virology. 4th edn. San Diego: Academic Press.

**Course title:** Immunological techniques **(**MLS -IMM-475)

**Duration and credits:** 15weeks (3CHs)

***Outline***

(1) reviews basic immunology {structure and function of the immune system) and {2) addresses the immunological defects and disorders including: {a) hypersensitivity reactions, (b) autoimmune disease, (c) transplantation rejection, and (d) immunodeficiency disorders. It includes (3) tumor immunology, {4) antigen presentation, {5) major histocompatibility complex molecules, (6) detection of lymphocytes and (7) complement deficiency

***Rationale***

This is a six- week-block module which: reviews basic immunology {structure and function of the immune system), addresses the immunological defects and furthermore, the course gives full understanding on the major immunological techniques which are used in the immunology lab to diagnose immune related disease/condition as well as their use in medical research*.*

***General objectives***

**By the end of this course the student is expected to:**

1. know the principles of the “Basic and Clinical immunology
2. Understand the principles of the immunological techniques and their applications.

***Specific objectives***

**By the end of this block course the student is able to:**

1. To describe the principles of the “Basic and Clinical immunology” in terms of:
2. The components/of the immune system.
3. The principles of the innate immunity and Adaptive Immunity.
4. Innate immune cells and inflammation
5. Complement system, complement deficiency, and diagnosis of complement related diseases
6. Development and biology of B and T cells and their cell markers
7. T cell receptor complex and T cell activation
8. Immunoglobulin structure/isotypes/idiotypes/allotypes and the biological functions
9. Generation of Immunoglobulin and T cell diversity
10. Major histocompatibility complex molecules
11. Antigen presenting cells, antigen processing and presentation
12. Cytokines and the important of cytokine in disease diagnosis
13. Diseases that are attributed to the Immune systems:
14. Hypersensitivity reactions
15. Immunodeficiency and immunodeficiency disorders
16. Autoimmune diseases and diagnosis
17. Tumor immunology
18. Principle of transplantation immunology and transplant rejection.
19. Principle of Immunization and Vaccines.
20. To understand the principles of the immunological techniques and their applications
21. The of role of antigen antibody interaction in diagnosing microbial infections and autoimmune diseases.
22. Detection , measurement and characterization of antibodies by ELISA techniques and radioimmunoassay
23. The use of cell cluster markers in diagnosing immune deficiency, cancer cells, autoimmune disease
24. Basic techniques in tissue typing and blood transfusion
25. Isolation of antibodies by affinity chromatograph
26. Immunoassay and measurement of immunity in vitro and in vivo
27. Serological tests: Agglutination/ Immune precipitation/ Neutralization/Complement fixation test/ Direct Agglutination Test (DAT)/Leishmanin Skin Test/Tuberculin test
28. Isolation of lymphocytes and lymphocytes stimulation
29. BPMC Cell culture and cytokine measurement
30. Immunofluorescence techniques
31. Rapid diagnostic tests (RDTs)
32. Protein separation using SDS-PAGE and Immuno-blotting technique
33. Immunohistochemistry techniques and Immunoelectron microscopy
34. Detection of lymphocytes using Flow-cytometry

***Education strategies and methods:***

Power point slide

Laboratory practice

Assignments

***Evaluation & assessments methods:***

Mid course exam ……………………………. 15%

Final theory exam …………………………….50%

Final practical exam…………………………..20%

Assignments …………………………………10%

Attendance …………………………………… 5%

***Recommended reading material.***

1. Medical microbiology, Green world + Patherer + Barer, chwchil

978 – 0443102103.

1. Abbas basic Immunology, Saunders 978 - 1416029748
2. Immunology, Male + Brostott + Roth + Roitt – 978 – 0808923329
3. Basic and Applied concepts of Immuno hematology,

Bloutery + Howard, 978 – 0323002349.

|  |
| --- |
| **Semester Eight**  **Syllabus**  **(Microbiology)** |

|  |  |
| --- | --- |
| **Course title:** | Bacteriological techniques |
| **Course symbols and numbers:** | MLS - BAC- 484 | |
| **Duration and credits:** | 15 weeks (3 CHs) (2+1) | |

This is a course covers the identification methods of Bacteria that cause infections in different body systems. It include the diseases, etiological agents, specimens collection, transportation and preservation and laboratory investigations of urinary tract infections, respiratory tract infections, skin infections, genital tract infections, central nervous system infections, blood circulation infections, gasterointestinal tract infections, water and milk examinations, methods of bacterial typing, methods of preservation of lab strains and mastering the of microbiology lab.

***Rationale***

This is a eight- week-block module which: reviews major bacteriological techniques used in the bacteriology lab facilitate the identification of bacterial infections according to different body systems and organs. In Bacteriology laboratory the isolation, identification and detection of suitable antibiotics for different bacteria participates greatly to medicine and infections control.

***General objectives:***

**Following the reading, lectures, lab, and activities the student should be able to:**

1. Name the bacterial diseases among different body organs and define the etiological agents of thosse diseases
2. Idetify the isolation of different aetiological agents of bacterial infections according to the site of infection (different body organs and systems)
3. Master bacteriology lab and able to perform different bacteriological and serological techniques used in identification and typing of bacterial infection.

***Specific objectives:***

1. Describe the structure, diseases, etiological agents and laboratory investigations of Urinary tract
2. List the major organisms , diseases and methods of lab diagnosis of the upper and lower respiratory tract infection
3. Define etiological agents of different diarrheal diseases and describe the processing methods of selected specimen
4. Describe the types,causative agents, suitable specimens, and laboratory diagnoasis of food poisoning .
5. Discuss specimen collection and identification of etiological agents of different types of centeral nervous system infections .
6. Define the causative agents of septicemia and bacteremia and methods of inculation of blood sample in different culture medias.
7. List the most common organisms cause different types the skin and wounds infection methods of dentification of it .
8. Explain the the types,causative agents, suitable specimens, and laboratory diagnoasis of organisms that cause gental tract infection
9. Discuss general methods used in typing of bacteria.
10. Discuss the different examinations of water and milk.
11. Define different methods use in preservation of stock culture of bacterial strains.

***Specific Laboratory Objectives***

**After completion of the course, the student will be able to:**

1. Master abacteriology lab.
2. Describe components and principles of operation of equipments used in the bacteriology laboratory.
3. Prepare different stains, culture media and biochemical tests.
4. Perform different examinations of water and milk.
5. Perform different serological test related to some bacterial infection.
6. Describe specimen collection and transportation, staining characteristic, media selection, and incubation conditions of:
7. Urine sample
8. Sputum sample
9. Stool samlple
10. Cerebrospinalfluid sample
11. Blood for culture
12. Sample from wounds
13. Samples from upper respiratory tract
14. Eye and ear sample.
15. Perform suitable tests for identifying the causative organisms.

## *Educational strategies:*

Lectures: power point presentations of the main topics.

Practical

Tutorials and group discussion.

***Reference:***

1. Medical microbiology, Green world + Patherer + Barer, chwchil 978 – 0443102103.
2. District Laboratory practical. In Tropical Countries cheesbrogh , 1 & 2, 978 – 0521676328,978 -0521676311

**Course Title Course Code:** Infection Control (MLS-INF-486)

**Credit hours :** 3(2+1)

**Duration :** 15weeks

**Disciplines involved :** Microbiology

***Prerequisites:***

General Microbiology.

***Rationale:***

The purpose of this course is to prepare healthcare workers to prevent and control the spread f infection using current, evidence-based knowledge of the chain of infection, standard precaution and transmission –based precaution and work practice controls. Responding to various types of emergencies sometimes puts public safety personnel at risk. Explore various response scenarios and demonstrate the ability to determine, provide, and properly employ the correct protective actions to reduce or eliminate the spread of infection to the patient and response personnel. Competencies include understanding the occupational need for infection control; usage of proper personal protective equipment; recognizing symptoms of various infectious; and demonstrating the proper method for cleaning, decontaminating, storing and disposing of biological hazardous waste.

## *Course contents:*

In this module that deals with sources of infection in the community and health institutions, in particular as related to medical/facilities, disinfection and sterilization, hand hygiene, personal protective equipments understanding the contagious and contaminating materials and the organisms likely to be transmitted from contacts with such material, identifying the potential sources of infection in laboratory.

## *Course out comes:*

***By the end of the course, students are expected to:***

1. The need for infection control in public safety positions

• Define the purpose of infection control

• Understand the state/federal laws and standards

• Relate employee and employer responsibilities

1. fundamental of principle of infection prevention

* stander precaution
* transmission-based precaution

1. Diseases reporting
2. Hand hygiene

* Sample procedure for performing hand hygiene
* Indication of hand hygiene’s.

1. Personal protective equipment

* Use of PPE
* Recommendation of donning PPE
* Recommendation of removing PPE

1. The importance of proper use of personal protective equipment, engineering controls, vaccinations, and other preventative measures

* Foster a positive attitude regarding proper use of all personal protective equipment
* Understand the importance of immunizations and vaccinations
* Explain the proper use of engineering controls and the importance of their use as a safety item

1. Health care personnel responsibility
2. Injection safety

* General safety precautions

1. Sterilization and disinfection

* Recognize the importance of the correct application of reprocessing methods for assuring the safety and integrity of patient care equipment.
* Identify the individual’s professional responsibility for maintaining a safe patient care environment.
* Recognize strategies for effective pre-cleaning, chemical disinfection, and sterilization of instruments and devices.

1. Identification and demonstration of the proper method for cleaning, decontaminating, storing equipment, and disposing of biological hazardous waste

* Identify signs, labels and color coding for proper waste disposal
* Define proper cleaning of contaminated equipment
* Define low, medium, and high levels of cleaning
* Define sterilization and identify situations when this is typically performed

1. Identifying potentially infectious patients
2. Contact precaution
3. Droplet precautions
4. Airborne precautions.

***Practical:***

1. Hand wash(hand hygiene ) and antisepsis
2. Using of Personal protective equipment
3. waste management
4. Sterilization efficiency

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 100%

***Required Resources (in details):***

1. Lecture room.
2. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

Murray, P.R., Rosenthal, K.S. and Pfaller, M.A. (2015) Medical microbiology. Philadelphia, PA, United States: Elsevier Science Publishing Co.

Damani, N.N. and Emmerson, A.M. (2004) Manual of infection control procedures. 2nd edn. London: Greenwich Medical Media.

Mausner, J.S., Kramer, S., Gann, P., Bowen, S.G., Morton, R. and with the collaboration of Richard Morton (1984) Mausner and Bahn Epidemiology: An introductory text. 2nd edn. Philadelphia: Saunders (W.B.) Co.

Weston, D. (2013) Fundamentals of infection prevention and control: Theory and practice. 2nd edn. United States: John Wiley & Sons

Drummond, M.F., Sculpher, M.J. and Claxton, K. (2015) Methods for the economic evaluation of health care programmes. Oxford, United Kingdom: Oxford University Press.

Lee, G. and Bishop, P. (2005) Microbiology: And infection control for health professionals. 3rd edn. Australia: Addison Wesley Longman Australia Pty.

**Course Title Course Code:**  Mycology (MLS-MYC-486)

**Credit hours :** 3(2+1)

**Duration :** 15 weeks

**Disciplines involved :** Microbiology

***Prerequisites:***

General Microbiology.

***Rationale:***

Fungi are ecologically and economically important because it affect positively or negatively in human life as well as plants and animals. Fungi cause wide range of infections which take long time to recover therefore, proper diagnosis of fungi is important.

## *Course contents:*

This course will provide students with a broad overview of group of fungi examine the biology of the true fungi and other groups of organisms traditionally classified with the fungi. Topics will include taxonomy, life history traits, ecology, physiology, and pathogenesis, different type of mycoses and evolutionary biology of the major classes and orders of fungi. Particular emphasis will be placed on the impact of fungi on human affairs. Laboratory exercises will emphasize the identification of these orders.

## *Course out comes:*

***By the end of the course, students are expected to:***

1. Describe the properties, features, and pathogenesis of fungal pathogens.
2. Perform the various technical methods used in the laboratory diagnosis of different fungal infections (mycoses).
3. Perform antifungal susceptibility testing.
4. Apply molecular characterization of different fungal pathogens.
5. Describe fungi shape, structure and be able to classify fungi accordingly.
6. Define the principle of specimens’ collection, processing, storage and safe disposal of human cells.
7. List the classification of fungal infections.
8. Describe the component of different types of media used for fungal growth.
9. Describe the Different methods of fungal diagnosis (direct microscopic examination, Slide culture technique serology and animal inoculation).
10. Define the causative agents, classification, pathogenesis, clinical finding and laboratory diagnosis of Dermatophytosis and other superficial mycosis. .
11. Describe the physiological specialization and phylogeny of fungi. Parasexual life cycle; Symbiotic associations of fungi with algae and Economic importance of fungi.
12. List the General characters pathophysiology & diagnosis of superficial cutaneous mycoses (Malassezia infections, Taenia nigra, Piedra, Dermatophytosis).
13. List the General characters pathophysiology & diagnosis of subcutaneous mycosis (Mycetoma, Sporortricosis, Chromoblastomycosis, Phaeohypomycosis, Rinosporidiosis, Lobomycosis).
14. List the General characters pathophysiology & diagnosis of Systemic mycoses-(Histoplasmosis, Blastomycosis, Coccidioidomycosis, Paracoccidioidomycosis)
15. List the General characters pathophysiology & diagnosis of Opportunistic mycoses-( Candidiasis, cryptococcosis, Penicilliosis, Aspergillosis, Zygomycosis General characters pathophysiology & diagnosis)
16. Define Occulomycosis & Otomycosis & Mycotic poisoning.
17. Describe the Potential targets for antifungal agents and Antifungal agents’ modes of action
18. Discuss monitoring of antifungal therapy, Immunotherapy and surgery.
19. Discuss the basic genetic make up of fungal geges and various methods of reproduction.
20. Describe the different Molecular methods used in the diagnosis of fungal infection.
21. Define the uses of Molecular methods in taxonomy and for the identification of fungal pathogens, Strain typing techniques, sampling techniques and epidemiology.

***Practical:***

* 1. **Introduction and structure of fungi:** Audio visual demonstration.
  2. **Laboratory diagnosis of fungal infections**-Specimens collection, transport of specimens.
  3. Microscopical examination of clinical samples.
  4. **Method of fungal isolation:** Slide culture technique.
  5. **Method of fungal isolation and** identification form culture (needle mount).
  6. **Superficial and cutaneous mycoses-1** identification from culture (needle mount).
  7. **Superficial and cutaneous mycoses**-**2** lab diagnosis of Malassezia infections, Taenia nigra, Piedra, Dermatophytosis.
  8. **Subcutaneous mycosis**; lab diagnosis of Mycetoma, Sporortricosis, Chromoblastomycosis, Phaeohypomycosis, Rinosporidiosis, Lobomycosis..
  9. **Systemic mycoses**; lab diagnosis of Histoplasmosis, Blastomycosis, Coccidioidomycosis, Paracoccidioidomycosis..
  10. **Opportunistic mycoses-1** lab diagnosis of Penicilliosis, Aspergillosis 1, Zygomycosis.
  11. **Molecular methods in medical mycology** Molecular methods in the diagnosis of fungal infection.
  12. **Miscellaneous infections.**

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Anaissie, E.J., McGinnis, M.R. and Pfaller, M.A. (2002) Clinical mycology. New York: Churchill Livingstone.

Larone, D.H. and Larone, D. (1995) Medically important fungi: A guide to identification. 3rd edn. Washington, D.C.: American Society for Microbiology.

de Hoog, G.S., Hoog, D., Guarro, J., Figueras, M.J. and Gene, J. (2001) Atlas of clinical fungi. 2nd edn. Utrecht: Centraalbureau voor Schimmelcultures [u.a.].

Hausler, W.J., Topley, W.W.C. and Wilson, S.G.S. (1998) Topley and Wilson’s microbiology and microbial infections: V. 3: Bacterial infections. 9th edn. London: Hodder Arnold.

|  |
| --- |
| **Semester Seven**  **Syllabus**  **(Histopathology and Cytology)** |

**Course Title Course Code:** AdvanceHistopathological Techniques 1 (MLS-HIS-474)

**Credit hours :** 3(2+1)

**Duration :** 15 weeks

**Disciplines involved :** Histopathology&Cytology

***Prerequisites:***

Normal Histology, Basic pathology, Immunology.

## *Rationale:*

Need of medical laboratory student especially to be aware of and perform all the basic and advanced techniques done in histopathology lab.

## *Course contents:*

The student carries out special staining techniques for different material and substance interfere with different disease that routine H&E stain fail to identify for example Detection of carbohydrate ,connective tissue fiber and cell ,pigment, lipid and nerve system demonstration, identification and demonstration of microorganism in tissue to confirm the suspected microbial diagnosis and tissue microarray techniques.

***Course out comes:***

***By the end of the course, students are expected to:***

1. Deal with, and select special procedures applied to differential diagnosis (special stains)
2. Acquire skills and performing all procedures of special stain for demonstration of different materials in tissues and microorganism.
3. Acquire skills and performing all procedures of special stain for demonstration and identification different disease accombiended and correlated with different substance ,material ,fibers across the whole span of life with their control techniques such as :-
4. Carbohydrates eg (musinous adenocarcinoma,glycogen storage disease)
5. Connective tissue eg hepatocellular fibrosis, renal basement membrane disease, cirrhosis, sarcoma
6. pigment(hemosidrosis, calcium accumulation,
7. Identification of microorganism in different diseases acquired in human tissue.(poots disease,Hpylori,asparagulus in lung,candida
8. Lipid demostration
9. Describe the APUD system(morphology-cell biology- the distribution and function of regulatory peptides).
10. Describe the Techniques used for the demonstration of neuroendocrine cells (tinctorial methods (PAS, Chrome alum haematoxylin, and silver impregnation methods).
11. Tissue microarray techniques.

***Practical:-***

1. Preparation of all spesail staing and reagent
2. PAS techniques for carbohydrate&amyloid (glycogen,neutral mucin)
3. PAS for microorganism eg fungi
4. Alcin blue for carbohydtrate (acid mucin )
5. Colloid ion for carbohydtrate and ather
6. Trichrom techniques for connective tissue fiber (liver fibrosis,renal tumor,lung fibrosis,)
7. Silver techniques for reticulin fiber and basement membrane,hexamine silver techniques,gorden &sweet techniques.
8. Perls Prussian blue techniques for ion (endogenous pigment).
9. Vancosa techniques for calcium deposition.
10. Dopa techniques for melanin.

***Educational Strategies and Methods:***

* 1. Lecture
  2. Tutorial
  3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Suvarna, K.S., Layton, C. and Bancroft, J.D. (2012) Bancroft’s theory and practice of histological techniques. 7th edn. Oxford: Elsevier Science Health Science div.

Drury, R.A.B., Wallington, E.A. and Carleton, H.M.M. (1980) Carleton’s histological technique. 5th edn. Oxford: Oxford University Press.

**Course Title Course Code:** Gynecological Cytology

(MLS-GYN-475)

**Credit hours :** 3 (2+1)

**Duration :** 15 weeks

**Disciplines involved :** Cytology & Histopathology

***Prerequisites:***

Normal histology, basic pathology.

## *Rationale:*

Importance of cytology as a branch of sciences that have a great impact on peoples life not only as a tool of diagnosis and follow- up of many diseases but also as an important tool of early detection of some types of cancers which threaten the life of thousands of people around the world and also as an important tool in some survey programs as that of cervical carcinoma, made it necessary to include a course this area talks in details about this science and its technologies in order to post graduate individuals with sufficient scientific ammunition provide health service for the benefit of their society, whether in the diagnostic field or area of research.

***Course out comes:***

***By the end of the course, students are expected to:***

1. Apply all techniques used for the preparation of cells for microscopy.
2. perform cytological techniques used for the preparation of cells for microscopy.(cytospin, Thinprep,cell membrane filter)
3. Describe cytology of infections and inflammatory conditions of the female genital tract.
4. Define the cytology of pre-malignant and malignant changes in female genital tract.

**The learning objectives of cervical cytology collection are to:**

1. Demonstrate understanding of the background, technique and interpretation of traditional slide and liquid‐based cervical cytology

2. Demonstrate the appropriate technique in collecting cervical cytology

3. Describe the screening intervals in different age groups

4. Counsel patients appropriately about the role of cervical cytology in the detection of cervical cancer and dysplasia

5- Communicate with the patient in a respectful, sensitive manner during the period of examination.

6- Use the spatula clover leaf end to collect ectocervical cells, or spatula end for vaginal cuff cells, and then smear them in a thin layer on the slide.

7- On the same slide, smear endocervical cells collected using a cytobrush. Only insert cytobrush superficially in pregnancy.

8- The student or assistant should spray the slide with cytology fixative immediately after cytology collection and place it in the appropriate container.

9- The student or assistant should label the container appropriately.

***Practical:-***

1. What is a Pap smear technique?
2. What a pap smear isn’t.
3. Workflow in the cytopathology laboratory Workflow in the cytopathology laboratory „ Pap smear terminology
4. Ancillary testing Ancillary testing „ Quality systems, educational programs Quality systems, educational programs and accreditation and accreditation
5. Advantages of liquid based pap.
6. The Bethesda System (TBS).

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%

Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Grubb, C. (1988) Diagnostic cytopathology: A text and colour atlas. Edinburgh: Churchill Livingstone.

Koss, L.G. and Melamed, M.R. (eds.) (2005) Koss’ diagnostic cytology and its histopathologic bases. 5th edn. Philadelphia, PA: Lippincott Williams and Wilkins.

Suvarna, K.S., Layton, C. and Bancroft, J.D. (2012) Bancroft’s theory and practice of histological techniques. 7th edn. Oxford: Elsevier Science Health Science div.

Drury, R.A.B., Wallington, E.A. and Carleton, H.M.M. (1980) Carleton’s histological technique. 5th edn. Oxford: Oxford University Press.

**Course Title Course Code:** Cytogenetic & Molecular Techniques 2

(MLS-CYT-476)

**Credit hours :** 3(2+1)

**Duration :** 15 weeks

**Disciplines involved :** Cytology & Histopathology

***Prerequisites:***

Normal histology, Basic pathology, Immunology.

## *Rationale*

Advances in human genetics and biotechnology are one of the most rapidly occurring developments in medicine. The present course is designed to address the basic and clinically relevant core knowledge and skills that need to be acquired by post graduates of the Faculty of Medical laboratory science and provide them with an advanced understanding and appreciation of current topics in molecular genetics, while developing skills in critical thinking and written expression.

## *Course contents:*

Genetics Technology utilizes laboratory techniques and instrumentation to explore the genetics of the cell. Specifically, genetics’ testing involves the study of chromosomes (Cytogenetic) as well as the analysis of DNA and RNA (Molecular Genetics). These investigations are performed on various human specimens including blood, amniotic fluid, bone marrow, tumors and fibroblasts (including fetal tissue). Genetic technologists perform laboratory tests and procedures to provide critical information which enable physicians to diagnose, treat and monitor a patient’s condition. Results have direct impact on patient care, family counseling, and future medical care.

## *Course out comes:*

***By the end of the course students are expected to:***

1. Understand the principles, uses, and techniques of methods of clinical genetics.
2. Perform the more advanced techniques used in cytogenetic laboratory.
3. Define the principles, procedures, and precautions of advanced Clinical genetics techniques eg Fish, flowcytometre.
4. An over view in culture techniques.
5. Perform chromosomal analysis.
6. Describe application of cytogenetics.
7. Describe genetic population.
8. Define regulation and gene expression.
9. Define Prokaryotic genetics.
10. Detection of pathogens technology.
11. Describe oncogenes and cancer.
12. Define Molecular markers application.
13. Define and understand DNA cloning.
14. Describe Immunogenetics.
15. Describe the principle of Tissue typing.

***Practical:-***

1 PCR techniques

2.-incytohibridization techniques.

3. chromosomal analysis techniques

4. flowcytometre.techniques

5. Fish techniques.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

H Lewis, R. (2010) Human genetics: The basics. London, United Kingdom: Routledge.

|  |
| --- |
| **Semester Eight**  **Syllabus**  **(Histopathology and Cytology)** |

**Course Title Course Code:** Advanced Histopathological techniques (MLS-AHIS-485)

**Credit hours :** 4(3+1)

**Duration :** 16 weeks

**Intended students :** Faculty: MLS Semester: 3 (MSc) / Batch No.: 1

**Course Coordinator:** Us. Alaa Ahmed

**Student coordinator:**

**Disciplines involved :** Cytology & Histopathology

***Prerequisites***

Normal Histology, Basic pathology, Immunology.

***Rationale***

Tissue typing is the matching of a patient, who requires a solid organ or bone marrow transplant, with potential donor(s) – ensuring they are compatible. Compatibility can involve matching HLA types or ensuring the patient does not have antibodies against potential donor’s HLA.

## *Course contents:*

Human organ transplantation is an expensive form of therapy where successful outcomes require high levels of expertise, careful monitoring of recipient and recipient compliance. The best use of donated organs requires careful candidate selection and timing and active management of patients waiting to be transplanted. Rapid tests are needed for organ donor evaluation and screening. Consideration should be given to the matching of “extended criteria” donors with appropriate recipients and quantifying the risk related to receiving these organs. Government oversight and regulation should require minimum qualifications for transplant surgeons and physicians, minimum ancillary and support services, together with minimum standards for organ donor evaluation, screening and documentation.

## *Course out comes:*

***By the end of the course students are expected to:***

1. Describe the HLA system and its’ relevance to transplantation.
2. Describe mechanisms of rejection including mechanisms of all recognition and the processes involved in the effectors arms of the immune system.
3. Perform and describe techniques for HLA typing and their significance.
4. Perform and describe techniques for anti HLA antibody screening (PRA testing and cross matching) and their significance.
5. Demonstrate the ability to interpret the results of tissue typing, antibody screening and cross match procedures.
6. Describe the basic components of culture media and the conditions required to grow and maintain cells in culture.
7. Explain sterile technique used for growing cells in culture, the sources of bacterial and fungal contamination and be able to identify contamination.
8. Demonstrate techniques used to transform, identify, and isolate cells of interest.
9. Perform all common cell culture techniques, principles of somatic and stem cell cultures.
10. Grow and maintain cells without contamination b-Maintain appropriate records for the growth and maintenance of cell cultures
11. Perform advanced cell culture techniques including isolation, transformation, and selection
12. Evaluate cell health, viability, and functional properties.
13. Understand the basic requirements for growing mammalian cells in culture
14. Understand sources of contamination, methods to prevent contamination, and identify contaminated cell cultures.
15. Understand methods to assess cell viability
16. Understand methods commonly used to transform and select cells.
17. Understand techniques used to assess cell protein expression
18. Demonstrate ability to grow and main adherent and suspension cell cultures without contamination
19. Demonstrate ability to freeze viable cells and recover these cells for future use
20. Demonstrate ability to prepare cells to be used in assays
21. Demonstrate ability to transform and isolate clones from cell lines
22. Isolate and grow primary cells.
23. Understand historical perspective of IVF.
24. Define female and male factor in infertility, indications for IVF.
25. Describe Male and Female Reproductive System (Structure & Function).
26. Understand biology of the gametes, fertilization and early embryo development.
27. Perform medical strategies for ovarian stimulation.
28. Perform Techniques of oocyte retrieval.
29. Perform methods of oocyte fertilization.
30. Decisions regarding embryo transfer.
31. Understand and remark Complications and Results.
32. Identify third party assisted reproduction.

32.1 Assisted Reproductive Technology (ART)

32.2 Assisted Conception: Skills and Techniques

32.3 Micromanipulation in ART

* 1. Infertility and ART: Developments and Current Issues.

1. Diagnostic application of immunuhistochemestry .
2. Method of immunohistochemestry.
3. Specific marker use in immunohistochemestry and there importance in diagnosis and prognosis.
4. Diagnostic application of Enzyme histochemestry techniques.
5. Diagnostic importance of Immunoflorecent technique.
6. Describe the methods used in an estimation of components in the CSF, Synovial, amniotic fluid and peritoneal fluid.
7. Define immunohistochemistry, antigen, antibody, antigen-antibody binding, polyclonal and monoclonal antibody .,pre-analytical steps in immunohistochemestry
8. Classification of marker according to their expression and co expression
9. Describe the characteristic of specific molecular markers of specific cellular events
10. Unmasking Ag method(retrieval technique)
11. Describe methods of visualizing antigen-antibodies interaction.
12. Enhancement and novel method for visualization
13. Specific Background staining and non specific
14. Quality control and trouble shooting in immunohistochemestry.
15. Describe the applications and types of frozen techniques
16. Application of in-situ hybridization principle and techniques method.
17. Application of diagnostic enzyme histochemestry
18. Apply enzyme histochemestry method and controle.
19. Diagnostic application of immunofleuresent techniques and procedure.
20. Diagnostic importance of Immunoflorecent technique.
21. describe the history of immunofluorescence
22. discuss the principle of immunofluorescence
23. describe the various types of immunofluorescence
24. describe the methods of various types of immunofluorescence with examples
25. practice “Quality control” for immunofluorescence
26. interpret the result of immunofluorescence
27. Describe the various applications of immunofluorescence.
28. Diagnostic application of immunofleuresent techniques and procedure.

*Practical:*

1. HLA typing techniques
2. Cell cell culture techniques including isolation, transformation, and selection
3. Freze viable cells and recovers techniques.
4. Isolation techniques.
5. Over view about different lab of IVF
6. 1- Perform Techniques of oocyte retrieval.
7. 2- Assisted Reproductive Technology (ART)
8. Preparation of tissue for immunohistochemestry
9. Unmasking AG(retrieval solution)
10. Apllication of different marker (primary AB)
11. Avidin biotin technique
12. Flex technique
13. EPO technique
14. PAP techniques
15. APAP technique.
16. Immunofleurecent techniques in paraffin section
17. Immunofleurecent techniques in frozen section
18. Immunofleurecent techniques in tissue microarray.
19. Immunofleurecent & immunohistochemestry techniques.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

# Danovitch, G.M. (ed.) (2009) Handbook of kidney transplantation. 5th edn. Philadelphia: Lippincott Williams and Wilkins.

**Course Title Course Code:** Non gyenacological Cytology .

(MLS-NGYN-484)

**Credit hours :** 3 (2+1)

**Duration :** 15weeks

**Disciplines involved :** Cytology & Histopathology

***Prerequisites:***

Normal histology, basic pathology.

## *Rationale:*

Importance of cytology as a branch of sciences that have a great impact on peoples life not only as a tool of diagnosis and follow- up of many diseases but also as an important tool of early detection of some types of cancers which threaten the life of thousands of people around the world ,made it necessary to include a course this area talks in details about this science and its technologies in order to post graduate individuals with sufficient scientific ammunition provide health service for the benefit of their society, whether in the diagnostic field or area of research.

***Course out comes***

***By the end of the course, students are expected to:***

1. Describe the cytology of the different systems of the body.
2. Describe normal and abnormal cellular changes.
3. Apply all techniques used for the preparation of cells for microscopy.
4. Describe the cytology of different types of cancers.
5. perform cytological techniques used for the preparation of cells for microscopy.(cytospin, Thinprep,cell membrane filter)
6. Apply methods of collection, preparation and preservation of cytological specimen.
7. Describe the cytology of the different systems of the body and normal and abnormal cellular changes,
8. Identify cytological changes in benign and malignant lesions in non gynecology specimen eg respiratory tract, GIT, urinary tract, and body cavities.
9. Apply the safety measures in cytology lab.
10. Review of the theoretical and practical aspects related to cell cycle.
11. Cell renewal, replication, proliferation and neoplasia.
12. The chemical factors related to carcinogenesis.
13. classification of cancers and stages of its formation and different histological features,
14. Identify methods of getting cells for microscopical examination including desquamated cells.
15. Identify (FNA) needle aspirations and biopsies.
16. Identify methods of laboratory diagnosis of different tumors including light and electron microscopy.

***Practical:-***

1- Preparation of sampling techniques

2- Staining of non gynecology techniques (pap stain, Romanowisky stain)

1. Cytospin techniques
2. Thin prep technique.
3. Membranes filter techniques.
4. Immunocytochemestry techniques.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions ) = 50%

Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References :***

Grubb, C. (1988) Diagnostic cytopathology: A text and colour atlas. Edinburgh: Churchill Livingstone.

Koss, L.G. and Melamed, M.R. (eds.) (2005) Koss’ diagnostic cytology and its histopathologic bases. 5th edn. Philadelphia, PA: Lippincott Williams and Wilkins.

Suvarna, K.S., Layton, C. and Bancroft, J.D. (2012) Bancroft’s theory and practice of histological techniques. 7th edn. Oxford: Elsevier Science Health Science div.

Drury, R.A.B., Wallington, E.A. and Carleton, H.M.M. (1980) Carleton’s histological technique. 5th edn. Oxford: Oxford University Press.

**Course Title Course Code:** Systemic Pathology

(MLS-PATH-486)

**Credit hours :** 2(2+0)

**Duration :** 15 weeks

**Disciplines involved :** Cytology & Histopathology

***Prerequisites***

Normal histology, basic pathology, Immunology

## *Rationale*

After the detailed study in semester 1,and the derives course of Histopathological technique of routine and special stain techniques used in histopathology lab and the study of the basics pathology and systemic pathology a course relating all these sciences had to be included to acquire the student the ability of applying these techniques to suggest a diagnosis.

## *Course contents:*

Module concerned with Systemic pathology of common inflammatory disease and cancer, the morbid anatomic and histological changes resulting from disease, including light microscopic appearance.

A technologist should name the lesions and diseases in various body regions, describe in details the microscopic appearance of acute and chronic inflammation, appearance of necrosis and fibrosis the microscopically manifestations of wound and bone healing.

selection and choosing of beast techniques will be challenge to have the truly diagnosis to ignore false negative result this will be firstly examining by routine H&E passing through special staining techniques and finally immunohistochemestry for differentiation cancer and prognostic value.

Recognize the value and technical limitations of needle biopsies and the procedures to reach a diagnosis, and correlate pathological history, radiographs and gross and microscopical features to suggest a diagnosis. The diagnostic conclusion should be always audited by a qualified pathologist and/or clinician supervising the technologist.

## *Course out comes:*

1. Histotechnologist should name the lesion and diseases in various body regions, concern with the morbid anatomic and histological change resulting from disease.
2. It is the science of differentiation microscopically between normal and abnormal tissue by histopathological technique and immunohistological technique
3. Describe and identify the microscopically characteristics of the common diseases of different body systems.
4. Diagnosis conclusion should be always audit by qualified pathologist supervision the histotechnologist.
5. Gain the experience of chooses suitable histochemical special staining& immunohistochemical marker techniques according to the specific disease.
6. Recognize the value and technical limitations of needle biopsies and the procedures to reach a diagnosis.
7. Have an overview in basic pathology by define cell injury,explain the causes of cell injury, List different types of cell injury,define apoptosis and its causes,define necrosis and list its different types.
8. Describe and identify the microscopical appearance of cell injury and necrosis.
9. List and define the different types of cellular adaptation mechanism.
10. Define inflammation, list the different types of inflammation,explain the causes of inflammation.
11. Discuss the cellular events of inflammation.
12. Discuss the role of chemo tactic agents in inflammation.
13. Describe and identify the microscopical appearance of different types of inflammation, describe the process of wound and bone healing.
14. Define neoplasia, discuss the routes of tumors metastases.
15. Discuss the differences between benign and malignant tumors.
16. List different tumors nomenclature, discuss the basics of tumors staging and grading.
17. Discuss the most common cases inflammatory and malignant which can be received in histopathology lab in different system for eg. respiratory system (nasal polyp core needle biopsy of lung& esophagus) ,GIT system( gall bladder, hepatocellular carcinoma ,pancreatic carcinoma sigmoid, colon, rectum colonoscopy, large bowel) ,renal system(kidney, core needle, reproductive system male(prostate) and female, hysterectomy, ovary, uterus , endocrine system(thyroid),nerve system brain tumor biopsy and e Describe the microscopical appearance of each common diseases .
18. Perform the beast and selected suitable histochemical staining techniques for diagnosis in this different cases.
19. Perform the different types of immunohisopathological markers used in the diagnosis of inflammatory and malignant disease of different body systems.
20. Discuss the role of immunohisopathological markers used in the diagnosis of and prognosis.
21. Describe and perform the beast preparation technique of core needle biopsy.

Practical:-

demonstration and identification of the most common histopathological cases of by routine H&E and special stain , finaly immunohisochemestry in different system

1-GIT tumor colorectal cancer

2-Respiraty system cancer lung cancer,esophagus.

4-Skin cancer melanoma .

5-breast cancer**.**

.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Suvarna, K.S., Layton, C. and Bancroft, J.D. (2012) Bancroft’s theory and practice of histological techniques. 7th edn. Oxford: Elsevier Science Health Science div.

Drury, R.A.B., Wallington, E.A. and Carleton, H.M.M. (1980) Carleton’s histological technique. 5th edn. Oxford: Oxford University Press.

Kumar, V., Abbas, A.K., Aster, J.C. and Perkins, J.A. (2012) Robbins basic pathology: With STUDENT CONSULT online access. 9th edn. Philadelphia, PA: Elsevier Health Sciences.

|  |
| --- |
| **Semester Seven**  **Syllabus**  **(Parasitology and Medical Entomology)** |

**Course Title Course Code:** Advanced Medical Entomology (MLS-AENT-475)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15 weeks

**Student coordinator:**

**Disciplines involved :** Parasitology

***Prerequisites:***

Physiology, Anatomy.

***Rationale***

Insects have tremendous potential for transmitting organisms that cause disease in human and other animals. The disease-causing organisms include protozoa, viruses, bacteria, and worms. The deadliest disease worldwide is malaria which is vectored by mosquitoes, which can also transmit viruses (including those causing encephalitis) and filarial nematodes. Other vectors include flies and tics.

## *Course contents:*

The course covers advanced topics describing the concepts associated with vector-borne diseases and demographic and descriptive epidemiology. Overview of Medical Entomology, concepts in vector- borne diseases, trends in the evolution of arthropod vectors of diseases, anthropozoonotic diseases, venonomous arthropods and their associated problems , psychogenic parasitosis , application of Molecular Biology , immunology and bioinformatics, pesticides used in control of vectors, forensic entomology, epidemiological studies, study populations ( demography and descriptive epidemiology and surveillance, phenomenon of diseases measuring health and diseases, risks factors for diseases acquisition , types of epidemiological studies and prevention and control programs of epidemic diseases.

.

## *Course out comes:*

***By the end of the course students are expected to:***

* Acquire knowledge about the tropical and subtropical problems.
* Recognize the various species of insects and arthropods involves in human disease.
* Describe the morphology of human parasites and the clinical pictures of parasitic diseases and develop a skill of differentiating between them.
* Be aware of the basics of management and control of such diseases, including pest’s control.
* Perform health education on behavioral and environmental preconditions promoting the transmission and control of the disease.
* Describe the clinical importance of arthropods.
* Identify vector – host – pathogens relationship.
* Conduct surveys on the epidemiology of vector- borne diseases.
* Apply advanced techniques for surveillance and diagnosis of vector- borne diseases
* Design programs to pesticides control.

***Practical:***

1. Entomological methods
2. Collection and preservation of objects
3. Identification of mosquitoes
4. Breeding and Dissection of insects
5. Identification Sand fly, Black fly, Tsetse fly, Horse fly, and Deer fly
6. Effect of insecticides
7. Identification of House fly
8. Diagnosis of Myiasis
9. Scorpions, spiders, Spanish fly, and vipers
10. Removal and identification of Flea
11. Removal and identification Mites and diagnosis of scapes Removal and identification Lice
12. Removal and identification Ticks.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%

Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Peters, W., Pasvol, G., Wallace Peters MD FRCP DTM&H and Geoffrey Pasvol MA FRCP FRCPE (2001) Tropical medicine and parasitology. 5th edn. London: Mosby.

Gockel-Blessing, E.A., Zeibig and Zeibig, E.A. (2012) Clinical parasitology: A practical approach. 2nd edn. Alexandria, VA, United States: Elsevier Health Sciences.

Fischbach, F.T. and Dunning, M.B. (2014) A manual of laboratory and diagnostic tests. 9th edn. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

Crewe, W., Haddock, D.R.W., Crewe, S.M. and Crewe, W.H. (1985) Parasites and human disease. London: Hodder Arnold.

Chiodini, P.L., Moody, A.H., Manser, D.W. and Britton, R. (2000) Atlas of medical helminthology and protozoology. 4th edn. Edinburgh: Churchill Livingstone.

Murray, P.R., Rosenthal, K.S. and Pfaller, M.A. (2015) Medical microbiology. Philadelphia, PA, United States: Elsevier Science Publishing Co.

Ambrose, D.P. (2007) The insects: Structure functions and Biodiversity. India: Kalyani Publishers.

.

Oseto, C. (2007) General and applied Entomology: Insect activity manual. Dubuque, IA, United States: Kendall/Hunt Publishing Company.

**Course Title Course Code:** Diagnostic Parasitological Techniques (MLS-PARA-476)

**Credit hours :** 3 Hours (2+1)

**Duration :** 15weeks

**Disciplines involved :** Parasitology

***Prerequisites:***

Physiology, Anatomy.

***Rationale:***

Parasitological diagnosis is important for management, follow up and prevention of parasitic infections. However special techniques are always needed to confirm the diagnosis and to maintain certain parasites.

## *Course contents:*

This course provides the students with information and technological skills to perform special parasitological techniques such as permanent of smears, cultivation of parasites and cryopreservation that used to diagnose and / or maintain parasites of medical importance

## *Course out comes:*

***By the end of the course students are expected to:***

1. Discuss the immunology to parasites and its role in the diagnosis of parasitic diseases.
2. Explain the immno-pathology and the determinants factors of parasitic diseases.
3. Recognize the role of vaccine in the control of parasitic diseases.
4. Discuss the principles of Electron, Fluorescent, Field contrast microscope.
5. Discuss fixative used for preservation of protozoa parasites.
6. Identify the stain fecal smears by using: Trichrome staining technique and Haemotoxylene staining technique.
7. Perform Permanent slides techniques.
8. Discuss cryopreservation of protozoa.
9. Outline the general principles of cultivation of parasites
10. Perform Histological techniques use for parasites.
11. Recognize adequate knowledge about the principles, and to practice the basic parasitological techniques used in the diagnosis of blood parasites
12. List the constituent of different stains used for staining blood smears (Giemsa, Field,Wright and Leishman stains).
13. Perform different staining techniques and cultural methods used for haemoparasites examination.
14. Outline the value and principles of immunodiagnostic in parasitic infection.

***Practical:***

1. Q.C measures and SOPs
2. Microscopy
3. Stool examination (general)
4. Staining of fecal smear
5. Techniques used in blood for parasitological studies
6. Preparation of culture media I (3 N)
7. Preparation of culture media II
8. Breeding and handling of laboratory models
9. Animal inoculation
10. Processing of tissues and aspirates for parasitological studies
11. Computer search and internet
12. Demonstration of radiological images
13. Conducting field survey
14. Examination of water, soil, and other environmental specimens

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Cheesbrough, M. (2005) District laboratory practice in tropical countries. New York, NY: Cambridge University Press.

Garcia, L.S. (2016) Diagnostic medical Parasitology. United States: American Society for Microbiology.

Fischbach, F.T. and Dunning, M.B. (2014) A manual of laboratory and diagnostic tests. 9th edn. Philadelphia, PA, United States: Lippincott Williams and Wilkins.

Course title: Tropical Parasitology

Course symbol and number: MLS-TPAR-474

Duration and credits: 15weeks (3 CHs)

Rationale

##### In spite of the great improvement and tremendous advances in science, medicine, public health and sanitation, there have been huge setbacks in the tropics. The challenges of tropical diseases, some of which have been with us for centuries.

##### Outline

##### (1) definition of tropical disease , (2) development of a drug, (3) (4) rational use of drugs in the management of emergency and common problems, including drug prescription.

**Objectives**

**By the end of this module the student should be able to:**

1. Define Tropical disease
2. Define Tropical disease transmission
3. Pathology and pathogenesis of Tropical disease
4. Outline the basics of the managements of tropical diseases
5. Explain the interaction between
6. Clarify interrelationship between parasitic infections ant parasitic ldrugs .
7. Outline the drug treatment of Tropical disease
8. Performe labolotoroy diagnosis of Tropical disease
9. Prevention and control of Tropical disease

##### Recommended Reading Material

Rang, Parmacology, 5e, Churchill Livingstone, ISBN 0443072027[IE].

|  |
| --- |
| **Semester Eight**  **Syllabus**  **(Parasitology and Medical Entomology)** |

**Course Title Course Code:** Epidemiology of Parasitic Disease (MLS-EPD-485)

**Credit hours :** 2(2+0)

**Duration :** 15weeks

**Disciplines involved :** Parasitology

***Prerequisites:***

Basic parasitology.

***Rationale:***

The course is designed to provide a background in epidemiology for students preparing for master degree. It is considered that all health professionals, be familiar with epidemiologic principles & methods, as they have an increasing role in providing preventive measures and in maintain the health of the community***.***

## *Course out comes:*

***By the end of the course, students are expected to:***

1. Define epidemiology.
2. Demonstrate knowledge of the nature and uses of epidemiology.
3. Characterize the basic epidemiologic concepts.
4. Define and use epidemiological terminology.
5. Demonstrate knowledge on basic epidemiological studies.
6. Describe the specific uses and applications of epidemiologic methods.
7. Demonstrate an understanding of the principles of screening, sensitivity and opeificty.
8. Calculate basic measurements in epidemiology.
9. Demonstrate the ability to understand the epidemiological aspects of infectious diseases.
10. Describe the different level of prevention of diseases.
11. Investigate an outbreak.
12. Interpret the results of epidemiological studies.
13. Describe the concept of disease surveillance.
14. Demonstrate Knowledge to the contribution of epidemiology to the promotion of health and prevention of disease***.***

***Practical:***

1. Fieldwork.

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Mausner, J.S., Kramer, S., Gann, P., Bowen, S.G., Morton, R. and with the collaboration of Richard Morton (1984) Mausner and Bahn Epidemiology: An introductory text. 2nd edn. Philadelphia: Saunders (W.B.) Co.

**Course Title Course Code:** Diagnostic Techniques in Parasitology (MLS-DPAR-486)

**Credit hours :** 3(2+1)

**Duration :** 15 weeks

**Disciplines involved :** Parasitology

***Prerequisites:***

Basic parasitology, diagnostic parasitology

***Rationale:***

Sudan is a country with a heavy burden of parasitic infections, the laboratory diagnosis is important for management, follow up and prevention. So the student specialize in parasitology should provided with advanced knowledge and skills of laboratory diagnosis.

## *Course out comes:*

***By the end of the course students are expected to:***

1. Provide the students with advanced parasitological techniques.
2. Explain the principle of light microscope.
3. Explain the principle of Electron microscope.
4. Explain the principles of Fluorescent microscope.
5. Describe and perform Quality control in parasitology
6. Demonstrate Collection and transport of specimens.
7. Assess quality of reagent and stain.
8. Assess performance of techniques.
9. Demonstrate detection and recognition of parasites.
10. Report and record results.
11. Out line fixative used to preserve cyst and eggs in faces.
12. Identify adult intestinal worms.
13. Describe the chemical methods for preservation of parasites.
14. Describe the physical methods for preservation of parasites.
15. Describe the preservation methods for parasites in urine.
16. Prepare a permanent mount of fecal sediment.
17. Prepare a permanent fecal smear.
18. Stain fecal smears by using: Trichrome staining technique, Acridine orange technique and Haematolocylene.
19. Stain the high risk bleeds film.
20. Collect and preserve cestodes adult worms.
21. Collect and preserve Nematodes adult worms.
22. Prepare Baermann’s apparatus.
23. Perform Baermann’s methods for concentrating S. stercoralis.
24. Perform Harnadi & Morsi techniques to differential hsok worm sp.
25. Perform micrometry.
26. Describe the preparation of Antigen & Immunosera.
27. Identify types of Antigens,
28. Describe and perform crgo preservation of parasites.
29. Outline the general principles for parasites culture.
30. Perform culture of intestinal amoeba, Trichomonas.
31. Perform culture of intestinal flagellates by using : LES medium, Jones and Dobell’s.
32. Modify tanabes medium.
33. Perform culture of malaparasites by using :
34. Perform culture of leishmania parasites by using: RPMI medium, N.N.N and Schneider’s enriched medium.
35. Perform culture of Trypenosomes by using : Weinmann’s medium and N.N.N medium.
36. Out line the general principle of animal inculcation.
37. Perform animal inculcation technique.
38. Examine internal organs from inculated animal lab.
39. Outline the general Entomological methods.
40. Describe collection of arthropods.
41. Preserve and mounting arthropods.
42. Identify methods of arthropods.
43. Identify molluscus species.
44. Perform shedding of cercariae out of snails.
45. Identify carcariae species.
46. Outline general principle of molecular diagnostic tech.
47. Perform PCR techniques.

***Practical:***

1. Electron microscope
2. fluorescent microscope
3. Quality assurance in Parasitology
4. Fixatives
5. cryopreservation
6. micrometry
7. Animal inoculation
8. Stains of faecal smears
9. Permanent slide techniques
10. Protozoan cyst count
11. Culture of urogenital flagellate
12. Culture of intestinal flagellate
13. Culture of Malaria
14. Culture of leishmania
15. Culture of trypanosome
16. Permanent slides techniques
17. Stained faecal smears
18. protozoan cyst count
19. Micrometry
20. parasite culture
21. Animal inoculation

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Garcia, L.S. (2016) Diagnostic medical Parasitology. United States: American Society for Microbiology.

**Course Title Course Code:** Immunoparasitology (MLS-IPAR-484)

**Credit hours :** 3(2+1)

**Duration :** 15 weeks

**Disciplines involved :** Parasitology

***Prerequisites:***

Basic immunology.

***Rationale:***

Immune-diagnosis is used to assist in the medical diagnosis of parasitic infections and in the epidemiology and control of parasitic diseases. Now a days many parasitic infection are diagnosed by immunological methods due to their simplicity, rapid and usually accurate result

## *Course content:*

The course covers topics explained the immune mechanisms associated with auto-immune- diseases and vaccine preparation. Immunological defects and disorders including hypersensitivity reactions and their diseases, autoimmune-diseases, major histo-compatibility Complex integers (MHC), and their role in organs and tissue grafting and diseases ( GVD), tumor immunology and immunodeficiency disorders, serological techniques role of eosinophils and Toll like receptors in parasitic infections, effectors mechanisms and effectors choice in parasitic infections, parasite define roles of regulatory cell , cytokines profiles associated with parasitic infections, cellular interactions in the immune response to helminthes, parasitic evasion mechanisms and human vaccines Provides the student with skills to perform molecular diagnostic techniques in Medical laboratories. Physical and chemical properties of DNA, types of RNA, PCR techniques, sensitivity and specificity, types of primers, types of diagnostic techniques (PCR, Probe, RELF, Sequencers).Molecular diagnosis of parasites , viruses and fungi, DNA cloning and sequencing, gene libraries , application of Biotechnology in vaccine production and gene therapy.

## *Course out comes:*

***By the end of the course, students are expected to:***

1. Discuss the immunology to parasites and its role in the diagnosis of parasitic diseases.
2. Explain the immnopathology and the determinants factors of parasitic diseases.
3. Recognize the role of vaccine in the control of parasitic diseases
4. Discuss immunity of Malaria parasites in regards to species and stages
5. Discuss immunity of trypanosome and its surface antigen variation.
6. Discuss immune response against Toxoplasma
7. Describe immune response to Leishmani parasites.
8. Discuss immune response against intestinal protozoa
9. Describe immune pathology of Schistosoma.
10. Discuss immune pathology of tissue and intestinal nematodes
11. Describe immune response against intestinal tape war
12. Discuss general principles and practical approaches in the use of immunology laboratory techniques to address parasitic diseases and epidemiologic problems.
13. Describe the structure and properties of nucleic acids (DNA and RNA).
14. Differentiate between molecular techniques used in molecular diagnosis.
15. Explain DNA cloning and sequencing.
16. Apply Biotechnology in vaccine production and gene therapy.

***Practical:***

Designation of molecular biology studies II

* Isolation of gene
* Sequencing
* Genetic engineering

Recombinant vaccine technology

Designation of molecular biology studies I

- Detection and identification of species

- Mutation detection

***Educational Strategies and Methods:***

1. Lecture
2. Tutorial
3. Practical

***Evaluation and Assessment Methods (%):***

Final exam:

* Written Exam (MCQs & structured questions) = 50%
* Practical = 50%

***Required Resources (in details):***

1. Lecture room.
2. Medical lab
3. Staff (Prof, Associate Prof. OR Assistant Prof and Lecturer).

***References:***

Peters, W., Pasvol, G., Wallace Peters MD FRCP DTM&H and Geoffrey Pasvol MA FRCP FRCPE (2001) Tropical medicine and parasitology. 5th edn. London: Mosby.

Perlmann, P. (2002) Malaria immunology: 13 tables. Edited by Peter Perlmann and M. Troye-Blomberg. 2nd edn. Basel: S Karger Pub.

Abbas, A.K., Lichtman, A.H., Pillai, S., Baker, D.L. and Baker, A. (2014) Cellular and molecular immunology. 8th edn. Philadelphia, PA, United States: Saunders.

Abbas, A.K. and Lichtman, A.H. (2006) Basic immunology: Functions and disorders of the immune system: 2006-2007. 2nd edn. Philadelphia, PA: Elsevier, Saunders

Goldsby, R.A., Kuby, J., Kindt, T.J. and Osborne, B.A. (2006) Kuby immunology: International edition. 5th edn. New York: Freeman, W. H. & Company.

Delves, P.J., Martin, S.J. and Burton, D.R. (2011) Roitt’s essential immunology: Includes free desktop edition. 12th edn. United Kingdom: Wiley-Blackwell (an imprint of John Wiley & Sons Ltd).