Almashreq university

Faculty of Medical Laboratory Sciences

Degree: BSc. Honor in Medical laboratory sciences.

The Profession:

Medical Laboratory Sciences is a healthcare profession concerned with performing various laboratory tests to aid the healthcare disciplines in the diagnosis and management of diseases and disorders. Medical Laboratory Technitians analyze clinical samples to detect chemical content, blood disorders, identification of microorganisms and other special investigations. Bsc. honor MLS program focuses on the imparting knowledge and developing skills to conduct various laboratory tests. This program is designed emphasizing on the modern trends of laboratory sciences and is delivered over 4 years (08 semesters) including in-servise training and graduation research project. Students enrolled in MLS major will develop problem-solving skills, logical reasoning ability and appropriate laboratory science competencies for professional practice through focused coursework and hands-on experience in the medical diagnostic laboratory. On successful completion of this program, the student will be awarded the degree of Bsc. honor MLS, which would be a stepping stone to a challenging career in laboratory Sciences.

The Mission:

The mission is to develop and maintain a superior educational program for future medical laboratory scientists. These well-trained scientists should be knowledgeable, highly skilled and ethical, prepared to practice as competent professionals and to contribute to the changing field of laboratory medicine.

The Vision:

The vision of the MLS program is providing professional education, as manifested by excellent learning environment and facilities, well-structured curriculum, experienced teaching staff and mentors, and reputable positive ethical codes of learning and practice. Placements will be undertaken in well equipped diagnostic and research laboratories in the faculty.

Objectives/aim of the course:

1. Proficiently perform a full range of clinical laboratory tests
2. Develop and evaluate test systems and interpretive algorithms
3. Manage information to enable effective, timely, accurate, and cost-effective reporting of laboratory-generated information

Expectation from the future graduate in providing patient care:

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

1. Perform routine clinical laboratory testing.
2. Make specimen-oriented decisions on predetermined criteria including working knowledge of critical values.
3. Communicate with other members of healthcare team, customers and patients in an effective manner.
4. Process information and ensure quality control as appropriate to routine laboratory procedures.
5. Train students in routine laboratory procedure.
6. Upgrade knowledge and skills in a changing healthcare scenario.
7. Should know the logical interpretation of clinical lab investigations.
8. Should be able to extrapolate data acquired
9. Should be able to working on automated machine.

Duration of the course

Duration of the course: Total 04 Years(08 semesters) didactic and practical, with Hospital training, and graduation research project.

Total credit hours for Bs. C (Honor) degree= 177 hrs.

Curriculum plan and regulations

- 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, and the fourth semesters are common to all departments of the program.
- The fourth to six semesters constitute mainly the specialization stage in MLS,
- And the last two semesters (seven & eight) represent the subspecialty in one the five departments of MLS.

Medium of instruction:

English shall be the medium of instruction for all the subjects of study and for examination of the course.

Attendance:

A candidate has to secure minimum- 1) 75% attendance in theoretical 2) 80% in Skills training (practical) for qualifying to appear for the final examination.

Assessment:

Assessments should be completed by the academic staff, based on the compilation of the student‘s theoretical &clinical performance throughout the training programme. To achieve this, all assessment forms and feedback should be included and evaluated. Students must attain a cumulative score of at least 50% marks in both theory and practical for each individual subject and internal assessment separately.

Evaluation%
Theory examination: 40%
Practical examination: 50%
Continual evaluation or activities (Seminars ,Group discussion and Assignments):10%

Instructional methods

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Entrance requirements:

A student interested in joining the Faculty of Medical Laboratory Sciences, has to:

1. Obtain pass mark in in seven subjects including: Arabic language, religious studies, English language, mathematics, physics, chemistry and biology. International students who have not studied Arabic and religious studies may have more alternative subjects from an approved list of subjects published in the webpage of Ministry of Higher Education.
2. Achieve the percentage in Sudan School Certificate announced every year (International students may have 10% less in the School Certificate scores.
3. Apply electronically though the website of the Admission and Accreditation Office, Ministry of Higher Education, or apply directly in Admission Office in the Almashreq University, and pass the health examination, aptitude tests and interview.

Curriculum Map:

Semester-1					الفصل الدراسي الأول				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
ANT111	Anatomy	2	1	3	3	1	2	التشريح	شرح111
ARB112	Arabic language I	3	0	3	3	0	3	اللغة العربية I	عرب112
CEM113	General chemistry	2	1	3	3	1	2	الكيمياء العامة	كيم113
BCM114	Biochemistry I	2	1	3	3	1	2	الكيمياء الحيوية I	كمح114
COM115	Computer application	2	1	3	3	1	2	تطبيقات علوم الحاسوب	حسب115
ENG116	English language	3	0	3	3	0	3	اللغة الاتجليزية I	انج 116
PHS117	General physics	2	0	2	2	0	2	الفيزياء العامة	فيز117
ISC118	Islamic culture I	3	0	3	3	0	3	الثقافة الاسلامية I	سلم 118
CAL119	Laboratory Calculations	2	1	3	3	1	2	حسابات معامل	حسا 119
Total credit hours		21	4	26	26	5	21	مجموع الساعات المعتمدة	

Semester-2					الفصل الدراسي الثاني				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
ARB121	Arabic language II	3	0	3	3	0	3	اللغة العربية II	عرب121
BCM122	Biochemistry II	2	1	3	3	1	2	الكيمياء الحيوية II	كمح122
ENG123	English medical terminology	3	0	3	3	0	3	المصطلحات الطبية الانجليزية	انج123
ISC124	Islamic culture II	3	0	3	3	0	3	الثقافة الاسلامية II	سلم124
CBG125	Cell biology	2	1	3	3	1	2	علم الخلية الاحيائية	خلح125
HST126	Histology	2	2	3	3	2	2	علم الانسجة	نسج126
SFT127	Laboratory safety	2	0	2	2	0	2	السلامة المعملية	سلع127
PHS128	Physiology	2	1	5	3	1	2	علم وظائف الاعضاء	وظف128
SUD129	Sudanese studies	2	0	2	2	0	2	الدراسات السودانية	سود129
		21	5	26	26	5	21		

Semester-3					الفصل الدراسي الثالث				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
IMN231	Basic immunology	2	0	2	2	0	2	علم المناعة الأساسي	منع231
HEM232	Basic haematology	2	1	3	3	1	2	علم الدم الساسي	أد232
HST233	Basic histopathological techniques	2	1	3	3	1	2	التقنيات الأساسية لعلم الأنسجة المريضة	نسج233
MCR234	Basic microbiology	2	1	3	3	1	2	علم الأحياء الدقيقة الأساسي	أحد234
CLN235	Principles of clinical chemistry	2	1	3	3	1	2	مبادئ الكيمياء السريرية	كمس235
INS236	Laboratory instrumentation	2	1	3	3	1	2	أجهزة المعامل	جهز236
PRA237	Nematodes	2	1	3	3	1	2	الديدان الأسطوانية	طفل237
	Total credit hours	14	6	20	20	6	14	مجموع الساعات المعتمدة	

Semester-4					الفصل الدراسي الرابع				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
HEM241	Basic haematological techniques	2	1	3	3	1	2	التقنيات الأساسية لعلم الدم	أدم241
MCR242	Basic microbiological techniques	2	1	3	3	1	2	التقنيات الأساسية لعلم الأحياء الدقيقة	أحد242
MLB243	Basic molecular biology	2	0	2	2	0	2	علم الأحياء الجزيئي الأساسي	أجز243
PRA244	Cestodes& trematodes	2	1	3	3	1	2	الديدان الشريطية والمثقبة	طفل244
IMN245	Clinical immunology	2	1	3	3	1	2	علم المناعة السريري	منع245
HST246	General pathology	2	1	3	3	1	2	علم الأمراض العام	نسج246
CLN247	Plasma proteins & electrolytes	2	1	3	3	1	2	بروتينلت البلازما والشوارد الكيميائية	كمس247
HST248	Tissue staining techniques I	2	1	3	3	1	2	تقنيات صبغ الأنسجة I	نسج248
Total credit hours		16	7	23	23	7	16	مجموع الساعات المعتمدة	

Semester-5					الفصل الدراسي الخامس				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
HEM351	Blood cell disorders	2	1	3	3	1	2	أمراض خلايا الدم	أدم351
PRA352	Intestinal & urogenital protozology	2	1	3	3	1	2	أوالي الامعاء والمجرى البولي التناسلي	طفل352
MNG353	Laboratory management and quality control	2	0	2	2	0	2	ادارة المعامل وضبط الجودة	أدر353
MCR354	Systematic bacteriology	2	1	3	**3**	1	2	علم البكتريا التصنيفي	أحد354
CLN355	Systemic chemical pathology	2	1	3	3	1	2	علم الكيمياء المرضية الجهازي	كمس355
HST356	Tissue staining techniques II	2	1	3	3	1	2	تقنيات صبغ الأنسجة II	نسج356
Total credit hours		12	5	17	17	5	12	مجموع الساعات المعتمدة	

Semester-6					الفصل الدراسي السادس				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
PAR361	Blood and tissue protozology	2	1	3	3	1	2	أوالي الدم والأنسجة	طفل361
FLD362	Body fluid analysis	2	1	3	3	1	2	تحليل سوائل الجسم	سوج362
CLN363	Enzymology, Endocrinology & Toxicology	2	1	3	3	1	2	علم الانزيمات، الغدد الصماء، والسميات	كمس363
GEN364	Genetics	2	1	3	3	1	2	الوراثة	ورث364
HEM365	Immunohaematology and haemostasis	2	1	3	3	1	2	علم الدم المناعي والارقاء الدموي	أدم365
MCR366	Medical Virology and Mycology	2	1	3	3	1	2	الفيروسات و الفطريات الطبية	أحد366
HST367	Diagnostic cytology	2	1	3	3	1	2	علم الخلايا التشخيصي	نسج367
Total credit hours		12	6	18	18	6	12	مجموع الساعات المعتمدة	

Semester-7-Medical Microbiology					الفصل الدراسي السابع- الأحياء الدقيقة الطبية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
MCR471	Systemic Microbiology	2	2	5	3	2	2	علم البكتريا الجهازي	أحد471
MCR472	Advanced medical mycology	2	1	3	3	1	2	علم الفطريات الطبية المتقدم	أحد472
GDS473	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق473
RES474	Research methodology	2	0	2	2	0	2	طرق البحث	طحث474
EPD475	Epidemiology and biomedical statistics	2	1	3	3	1	2	علم الأوبئة والاحصاء الحيوي	وبا475
MLB476	Advanced molecular biology	2	1	3	3	1	2	علم الاحياء الجزيئي المتقدم	أجز476
TRN477	Hospital training (1)	0	4	4	4	4	0	تدريب المستشفيات (1)	درب477
Total credit hours		13	9	22	22	9	13	مجموع الساعات المعتمدة	

Semester-7-Clinical chemistry					الفصل الدراسي السابع- الكيمياء السريرية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
CLN471	Advanced chemical pathology I	2	2	2	3	2	2	علم الكيمياء المرضية المتقدم I	كمس471
CLN472	Quality control in clinical chemistry	2	1	3	3	1	2	ضبط الجودة في الكيمياء السريرية	كمس472
GDS473	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق473
RES474	Research methodology	2	0	2	2	0	2	طرق البحث	طحث474
EPD475	Epidemiology and biomedical statistics	2	1	3	3	1	2	علم الأوبئة والاحصاء الحيوي	وبا475
MLB476	Advanced molecular biology	2	1	3	3	1	2	علم الاحياء الجزيئي المتقدم	أجز476
TRN477	Hospital training (1)	0	4	4	4	4	0	تدريب المستشفيات (1)	درب477
Total credit hours		13	9	22	22	9	13	مجموع الساعات المعتمدة	

Semester-7-Medical parasitology and Entomology					الفصل الدراسي السابع- الطفيليات والحشرات الطبية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
PRA471	Clinical parasitology	2	2	2	3	2	2	علم الطفيليات السريري	طفل471
PRA472	Medical Entomology	2	1	3	3	1	2	الحشرات الطبية	طفل472
GDS473	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق473
RES474	Research methodology	2	0	2	2	0	2	طرق البحث	طحث474
EPD475	Epidemiology and biomedical statistics	2	1	3	3	1	2	علم الأوبئة والاحصاء الحيوي	وبا475
MLB476	Advanced molecular biology	2	1	3	3	1	2	علم الاحياء الجزيئي المتقدم	أجز476
TRN477	Hospital training I	0	4	4	4	4	0	تدريب المستشفيات I	درب477
Total credit hours		13	9	22	22	9	13	مجموع الساعات المعتمدة	

Semester-7-Haematology&Immunohaematology					الفصل الدراسي السابع- أمراض الدم والمناعة الدموية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
HEM471	Red blood cell disorders	2	2	2	3	2	2	أمراض خلايا الدم الحمراء	أدم471
HEM472	Blood transfusion	2	1	3	3	1	2	نقل الدم	أدم472
GDS473	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق473
RES474	Research methodology	2	0	2	2	0	2	طرق البحث	طحث474
EPD475	Epidemiology and biomedical statistics	2	1	3	3	1	2	علم الأوبئة والاحصاء الحيوي	وبا475
MLB476	Advanced molecular biology	2	1	3	3	1	2	علم الاحياء الجزيئي المتقدم	أجز476
TRN477	Hospital training I	0	4	4	4	4	0	تدريب المستشفيات I	درب477
Total credit hours		13	9	22	22	9	13	مجموع الساعات المعتمدة	

Semester-7-Histopathology and cytology					الفصل الدراسي السابع- الأنسجة المريضة والخلايا				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
HST471	Advanced histopathological techniques	2	2	2	3	2	2	تقنيات علم الأنسجة المريضة المتقدمة	نسج471
HST472	Enzyme and immunohistochemistry	2	1	4	4	1	2	كيمياء الأنسجة المناعية والانزيمية	نسج472
GDS473	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق473
RES474	Research methodology	2	0	2	2	0	2	طرق البحث	طحث474
EPD475	Epidemiology and biomedical statistics	2	1	3	3	1	2	علم الأوبئة والاحصاء الحيوي	وبا475
MLB476	Advanced molecular biology	2	1	3	3	1	2	علم الاحياء الجزيئي المتقدم	أجز476
TRN477	Hospital training I	0	4	4	4	4	0	تدريب المستشفيات I	درب477
Total credit hours		13	9	22	22	9	13	مجموع الساعات المعتمدة	

Semester-8-Medical Microbiology					الفصل الدراسي الثامن-الأحياء الدقيقة الطبية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
MCR481	Advanced diagnostic microbiology	2	2	4	4	2	2	علم الأحياء الدقيقة التشخيصي المتقدم	أحد481
MCR482	Advanced medical virology	2	1	3	3	1	2	علم الفيروسات المتقدم	أحد482
GDS483	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق483
IMN484	Advanced diagnostic immunology	2	1	3	3	1	2	علم المناعة التشخيصي المتقدم	منع484
PET485	Professionalism and Ethics	2	0	2	2	0	2	المهنية وأخلاقيات المهنة	مهن485
TRN486	Hospital training II	0	4	4	4	4	0	تدريب المستشفيات II	درب486
GPR487	Graduation project	0	6	6	6	6	0	مشروع التخرج	بحث487
Total credit hours		11	14	25	25	14	11	مجموع الساعات المعتمدة	

Semester-8-Clinical chemistry					الفصل الدراسي الثامن-الكيمياء السريرية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
CLN481	Advanced chemical pathology II	2	2	4	4	2	2	علم الكيمياء المرضية المتقدم II	كمس481
CLN482	Selected topics in clinical chemistry	2	1	3	3	1	2	مواضيع مختارة في الكيمياء السريرية	كمس482
GDS483	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق483
IMN484	Advanced diagnostic immunology	2	1	3	3	1	2	علم المناعة التشخيصي المتقدم	منع484
PET485	Professionalism and Ethics	2	0	2	2	0	2	المهنية وأخلاقيات المهنة	مهن485
TRN486	Hospital training II	0	4	4	4	4	0	تدريب المستشفيات II	درب486
GPR487	Graduation project	0	6	6	6	6	0	مشروع التخرج	بحث487
Total credit hours		11	14	25	25	14	11	مجموع الساعات المعتمدة	

Semester-8-Medical parasitology and Entomology					الفصل الدراسي الثامن-الطفيليات والحشرات الطبية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
PRA481	Diagnostic parasitology	2	2	4	4	2	2	علم الطفيليات التشخيصي	طفل 481
PRA482	Immuno- and molecular parasitology	2	1	3	3	1	2	علم الطفيليات المناعي والجزيئي	طفل482
GDS483	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق483
IMN484	Advanced diagnostic immunology	2	1	3	3	1	2	علم المناعة التشخيصي المتقدم	منع484
PET485	Professionalism and Ethics	2	0	2	2	0	2	المهنية وأخلاقيات المهنة	مهن485
TRN486	Hospital training II	0	4	4	4	4	0	تدريب المستشفيات II	درب486
GPR487	Graduation project	0	6	6	6	6	0	مشروع التخرج	بحث487
Total credit hours		11	14	25	25	14	11	مجموع الساعات المعتمدة	

Semester-8-Haematology&Immunohaematology					الفصل الدراسي الثامن-أمراض الدم والمناعة الدموية				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
HEM481	White blood cell disorders	2	2	4	4	2	2	أمراض خلايا الدم البيضاء	أدم 481
HEM482	Haemostatic disorders	2	1	3	3	1	2	أمراض الارقاء الدموي	أدم482
GDS483	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق483
IMN484	Advanced diagnostic immunology	2	1	3	3	1	2	علم المناعة التشخيصي المتقدم	منع484
PET485	Professionalism and Ethics	2	0	2	2	0	2	المهنية وأخلاقيات المهنة	مهن485
TRN486	Hospital training II	0	4	4	4	4	0	تدريب المستشفيات II	درب486
GPR487	Graduation project	0	6	6	6	6	0	مشروع التخرج	بحث487
Total credit hours		11	14	25	25	14	11	مجموع الساعات المعتمدة	

Semester-8-Histopathology and cytology					الفصل الدراسي الثامن-الأنسجة المريضة والخلايا				
Course code	Course title	Credit hours			الساعات المعتمدة			عنوان المقرر	رمز المقرر
		Theory	Practical	Total	المجموع	عملي	نظري		
HST481	Cytogenetics and tumor pathology	2	2	3	3	2	2	وراثة الخلية وعلم أمراض الأورام	نسج 481
HST482	Selected Topics in Histopathology:	2	1	4	4	1	2	مواضيع مختارة في علم الانسجة المريضة	نسج482
GDS483	Group discussion	3	0	3	3	0	3	حلقات نقاش	منق483
IMN484	Advanced diagnostic immunology	2	1	3	3	1	2	علم المناعة التشخيصي المتقدم	منع484
PET485	Professionalism and Ethics	2	0	2	2	0	2	المهنية وأخلاقيات المهنة	مهن485
TRN486	Hospital training II	0	4	4	4	4	0	تدريب المستشفيات II	درب486
GPR487	Graduation project	0	6	6	6	6	0	مشروع التخرج	بحث487
Total credit hours		11	14	25	25	14	11	مجموع الساعات المعتمدة	

Almashreq university

Faculty of Medical Laboratory Sciences

Bachelor (Honor) in Medical Laboratory Science

Courses contents:

SEMESTER ONE

Course title: Anatomy

Course code: ANT111

Intended semester: (1)

Course duration: 15 weeks

Credit hours: 3(2+1)

Course description:
This course designed for medical laboratory students to identify the functional organization of the human body at the gross and the anatomical and medical terminology

Course objectives:
By the end of this course, student will be able to

1. Define anatomical and medical terminology and basic information about the structural anatomy of the human body.
2. Recognize the structural and functional organization of the human body at the gross (macroscopic) level.

Instruction methods

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Continual evaluation:20%

Course contents:

Week (1)	Introduction to the human body.
Week (2)	Anatomy of the Musculoskeletal system
Week (3)	Cardiovascular System (Heart)
Week (4)	Cardiovascular System (Blood vessels)
Week (5)	Lymphatic System
Week (6)	Respiratory system
Week (7)	Digestive System (GIT)
Week (8)	Digestive System (Liver, Spleen, & Pancreas)
Week (9)	Tutorial

Week (10)	Urinary System
Week (11)	Male genital System
Week (12)	Female genital System
Week (13)	Nervous System (Brain)
Week (14)	Nervous System (Spinal cord + PNS)
Week (15)	OSPE (Test)

Practical:

Week (1)	Orientation
Week (2)	Anatomy of the Musculoskeletal system
Week (3)	Cardiovascular System: Heart
Week (4)	Cardiovascular System: Blood vessels
Week (5)	Lymphatic System
Week (6)	Respiratory system
Week (7)	Digestive System: GIT
Week (8)	Digestive System: Liver, Spleen, and Pancreas
Week (9)	Tutorial
Week (10)	Urinary System
Week (11)	Male genital System
Week (12)	Female genital System
Week (13)	Nervous System: Brain
Week (14)	Nervous System: Spinal cord and PNS
Week (15)	OSPE

References:

- Abrahams P.H. Hutchings R.T., Marks Jr S.C. (1998). McMinn's colour atlas of human anatomy. 4th edition. London: Mosby
- April E.W. (1997). Clinical anatomy. 3rd edition. Philadelphia: Lippincott Williams & Wilkins.
- Donnersberger A.B., Scott A.L. (2005). A laboratory textbook of anatomy and physiology. 8th edition. London: Jones and Bartlett publishers.

اسم المنهج: اللغة العربية I

رمز المنهج: عرب 112

الساعات المعتمدة: ثلاث ساعات

الفترة الدراسية: الفترة الأولى

الفترة الزمنية للمنهج: 15 أسبوع

<u>الأهداف العامة للمنهج</u>

عند إتمام دراسة المنهج ينبغي أن يكون الطالب قادرا على:

1. معرفة الأسس والمفاهيم العلمية التي تساعد الطالب في الاستفادة من المراجع العلمية المكتوبة باللغة الإنجليزية .

2. الإسهام بصورة فاعلة في سياسات التعليم العالي بدفع عجلة التعريب.

<u>الأهداف الخاصة للمنهج</u>

عند إتمام دراسة المنهج ينبغي أن يكون الطالب قادراً على :

1- معرفة حقيقة اللغة ونشأتها ومعالجة الأخطاء الشائعة بين الطلاب

2- الإلمام بصياغة المصطلح العلمي ووضعه من المصادر المختلفة

3- معرفة بعض العلوم المساعدة فى وضع المصطلح العلمي كالنحت والاشتقاق

4- الإلمام بقواعد وأساسيات الترجمة والتعريب .

5- معرفة المستويات اللغوية والاختلاف بين الإنجليزية والعربية في النبر .

طرق التدريس:

- محاضرات
- أنشطة (سمنارات، حلقات نقاش)

تقويم المقرر:

- امتحان تحريري: 80%
- أنشطة: 20%

<u>محتويات المنهج</u>

الأسبوع الأول: حقيقه اللغة ونشأتها

الأسبوع الثاني: الفرق بين اللغة وعلم اللغة

الأسبوع الثالث: نافذة على اللغة: معالجة الأخطاء الشائعة وسط الطلاب

الأسبوع الرابع: أساليب الكلام: الإيجاز والإطناب والمساواة

الأسبوع الخامس: الترقيم: الأغراض

الأسبوع السادس:الترقيم : علاماته واستخداماتها

الأسبوع السابع: المصطلح العلمي : قوانين صياغة المصطلح العلمي .

الأسبوع الثامن: وضع المصطلح العلمي من التراث.

الأسبوع التاسع: وضع المصطلح العلمي من الطرق المتعددة لتوليد الألفاظ

الأسبوع العاشر: وضع المصطلح من الصياغة العربية للعرب والدخيل

الأسبوع الحادي عشر: وضع المصطلح العلمي من الجهود المبذولة من قبل العلماء

الأسبوع الثاني عشر: الاشتقاق وتعريفه تقسيم اللغات حول الاشتقاق

الأسبوع الثالث عشر: أصل الاشتقاق

الأسبوع الرابع عشر: أنواع الاشتقاق

الأسبوع الخامس عشر: النحت: تعريفه رأي الباحثين

المراجع:

- عباس محجوب محمود. (2016). تدريس مهارات اللغة العربية للكليات الطبية. الطبعة الأولى. الخرطوم: مطبعة جامعة النيلين.
- رشدي أحمد طعمية. (2004). المهارات اللغوية: مستوياتها، تدريسها. صعوباتها. الطبعة الأولى. القاهرة: دار الفكر العربي.
- فاضل صالح السامرابي. (2001). الجملة العربية: تأليفها وأقسامها. الطبعة الثانية. القاهرة: دار الفكر.

Course title: General chemistry

Course code: CEM113

Intended semester: (1)

Course duration: 15 weeks

Credit hours: 2(2+0)

Course description:
Chemistry is a rejuvenated science that is widely applied in our life therefore it should go beyond the traditional concepts of high school lessons , to apply this idea certain topics that will assist students in understanding advance courses in senior class should be included.

Course objectives and learning outcomes:
By the end of this course, medical laboratory students should be able to:

1. Know the major principles and properties of organic, physical, and analytical chemistry.
2. Understand the basic technology of organic, physical, and analytical chemistry.
3. Demonstrate laboratory skills associated with measurement, equipment selection, precision, accuracy, chemical techniques, safety, and chemical handling.
4. Perform laboratory experiments which illustrate chemical concepts, properties, theories, laws, and behavior of compounds.

Instruction methods:

- Lectures
- Activities (Tutorials, assignments and seminars)

Evaluation:

- Theory examination: 80%
- Continual evaluation or activities (Seminars ,Group discussion and Assignments):20%

Theory contents:

Week (1)		Importance of sciences (Chemistry)
Week (2)		Properties of matter and chemistry of element
Week (3)		Terminology of the elements and their symbols (Naming formula and structural formula of common chemical compound)
Week (4)		Calculations in chemistry (amount of the elements and compounds during the chemical reaction)
Week (5)		Types of chemical reaction and chemical equation.
Week (6)		Acids & bases(Definition and properties)

Week (7)		Acid- base interaction pH , pOH and buffer solution
Week (8)		Mid term exam
Week (9)		Solutions and its concentration.
Week (10)		Solutions types and solubility rules.
Week (11)		Ionic and covalent bonding and bond polarity
Week (12)		Separation technique in chemistry**:** Properties & types.
Week (13)		Fundamental chemistry of carbon compounds, structures, and properties
Week (14)		Reaction mechanisms and synthesis
Week (15)		Functional Groups & properties & reactions

Practical contents:

Week (1)		Demonstration Laboratory items and labsaftey
Week (2)		Properties of matter and chemistry of element
Week (3)		Terminology of the elements and their symbols (Naming formula and structural formula of common chemical compound)
Week (4)		Calculations in chemistry (amount of the elements and compounds during the chemical reaction)
Week (5)		Types of chemical reaction and chemical equation.
Week (6)		Acids & bases(Definition and properties)
Week (7)		Acid- base interaction pH , pOH and buffer solution
Week (8)		Mid term exam
Week (9)		Solutions and its concentration.
Week (10)		Solutions types and solubility rules.
Week (11)		Ionic and covalent bonding and bond polarity
Week (12)		Separation technique in chemistry**:**

		Properties & types.
Week (13)		Fundamental chemistry of carbon compounds, structures, and properties
Week (14)		Reaction mechanisms and synthesis
Week (15)		Functional Groups & properties & reactions

References:

- Burdge J. (2009). Chemistry. International student edition. New York: McGraw Hill
- Ebbing D.D., Gammon S.D. (2009). General chemistry.9th edition. Boston: Houghton Mifflin company.
- Kenkel J. (2011). Basic chemistry concepts and exercises. 1st edition. Boca Raton: Tylor & Francis group.

Course title: Biochemistry-1

Course code: BCM114

Intended semester: (1)

Course duration: 15 weeks

Credit hours: 3(2+1)

Course description:

This course designed to know the chemical constituents of cells and chemical composition of carbohydrates, lipids, proteins and amino acids, enzymes, hormones, vitamins and nucleic acids

Course objectivesand learning outcomes:

By the end of this course, medical laboratory science students should:

1. Identify the chemical constituents of cells togather with their chemical reactions, pathways and functions.
2. Identify the chemical composition of carbohydrates, lipids, proteins and amino acids, enzymes, hormones, vitamins and nucleic acids.
3. Emphasize basic structure, of carbohydrates, lipids, proteins and amino acids, enzymes and nucleic acids.

Instruction methods:

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Continual evaluation or activities (Seminars ,Group discussion and Assignments):20%

Course contents:

Week (1)	Cell macro-molecules and micro-molecules Nutrition and classification
Week (2)	Structure of Carbohydrates
Week (3)	Classification (Monosaccharides, disaccharides, and polysaccharides) Chemical properties
Week (4)	Glycoproteins Glycosaminoglycans
Week (5)	Lipids concepts and types Biological functions, and chemical reaction

Week (6)	Fatty acids and triglycerol
Week (7)	Lipoprotein (LDL, HDL) Cholesterol and steroids
Week (8)	Amino acids (concepts, types, nomenclature) Peptides and amide bond and examples
Week (9)	Structure of proteins and function (primary, secondary, tertiary and quaternary structure) Motifs and Domains (alpha helix and β- sheet)
Week (10)	Globular and fibrous proteins (myoglobulin and albumin, Hemoglobin) Iron metabolism.
Week (11)	Structure, Classification and Biological functions of Enzymes
Week (12)	Factors affecting enzymes Coenzymes
Week (13)	Structure, Classification and Biological functions of Hormones
Week (14)	Classification , Sources and Biochemical function of Vitamins
Week (15)	Structure classification and Biological functions of Nucleic acids

Practical	
Week (1)	Orientation
Week (2)	Water, PH and Buffer -1
Week (3)	Water, PH and Buffer -2
Week (4)	Carbohydrate chemistry: Molish test
Week (5)	Carbohydrate chemistry:Iodine test
Week (6)	Carbohydrate chemistry: Barfoed test
Week (7)	Carbohydrate chemistry: Benedict test
Week (8)	Carbohydrate chemistry: Bial's test and Seliwanoff's test
Week (9)	Lipid chemistry: Sudan III test
Week (10)	Lipid chemistry: Test of saturation (Iodine)
Week (11)	Lipid chemistry: molybdate test
Week (12)	Lipid chemistry:Liebermann test for cholesterol
Week (13)	Amino Acids: Ninhydrine test and nitroprusside test
Week (14)	Amino Acids:Xanthoprothic test and Chromatography
Week (15)	Protein chemistry: Biuret test – Denaturation (Strong acid and Heavy Metals)

References:

- Champe P.C., Harvey R.A., Ferrier D.R. (2005). Biochemistry. 3rd edition. USA: Lippincott Williams & Wilkins.
- Campbell P.N., Smith A.D., Peters T.J. (2005) Biochemistry illustrated. 5th edition. Philadelphia: Elsevier limited.
- Elliot W.H, Elliot D.C. (2006). Biochemistry and molecular biology. 3rd edition. New York: Oxford University press.

Course title: Computer application

Course code: COM115

Credit hours: 3(2+1)

Intended semester: (1)

Course duration: 15 weeks

Course description:
This course provides the basic knowledge make the students capable to develop computer and information literacy skills and use the computer in different educational and professional activities.

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

1. Recognize the core concepts of information literacy and essential techniques for locating, analyzing, organizing and presenting information.
2. Use the mouse, disk and file management and overall desktop techniques.
3. Discuss the wide-range use of computers today in information processing.
4. Use common office application software along with communications software.
5. Have the ability in using one specific operating system and should be aware of the existence of other operating systems, networks and their characteristics.
6. Identify the basic concepts of spreadsheets and to demonstrate the ability to use a spreadsheet application on a personal computer.
7. Accomplish basic operations associated with developing, formatting and using a spreadsheet.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	General Concepts: • Hardware, Software, Information Technology • Types of Computer

	• Main Parts of a Personal Computer
Week (2)	Hardware: • Central Processing Unit
Week (3)	Hardware: • Input Devices • Output Devices
Week(4)	Storage: • Memory Storage Devices • Types of Memory
Week (5)	Storage: • Measuring Memory • Computer Performance
Week(6)	SoftwareL: • Types of Software • Operating System Software
Week (7)	Software: • Applications Software • Systems Development
Week (8)	Information Networks: • LAN and WAN • The Telephone Network in Computing
Week (9)	Information Networks& electronic Mail
Week (10)	Information Networks: • The Internet
Week (11)	Computers in Everyday Life: • Computers in the home • Computers at Work or in Education • Computers in Daily Life
Week (12)	IT and Society: • A changing world • A good workplace • Health and Safety
Week (13)	Security, Copyright and the Law: • Security • Computer Viruses
Week (14)	Security, Copyright and the Law: • Copyright • Data Protection Act
Week (15)	Tutorial

Practical:	
Week (1)	First steps with computer Start and shut down the computer properly. Basic Information and Operations View the computer's basic system information
Week (2)	Desktop Environment Work with icons
Week (3)	Desktop Environment Work with Windows
Week(4)	Organizing Files Directories/Folders
Week (5)	Organizing Files Duplicate, Move, Delete,& Restore
Week(6)	Organizing Files Searching
Week (7)	Simple Editing Use a text editing application
Week (8)	*Tutorial*
Week (9)	Print Management Setup & Print Outputs.
Week (10)	First steps with spreadsheets Open a spreadsheet application
Week (11)	Basic Operations *Insert &Select Data*
Week (12)	**Formulas and Functions:** Format Cells – Cell Ranges
Week (13)	**Formulas and Functions:***Spelling &document Setup*
Week (14)	**More Advanced Features:** *Importing Objects*
Week (15)	*Tutorial*

References:

- Brands G. (2013). Introduction to computer science: a textbook for beginners in informatics. 1st edition. CreatSpace independent publishing platform.
- Hare K. (2017). Computer science principles: The fundamental concepts of computer science. 1st edition. Independently published.
- Patterson D., Hennessy J. (2013). Computer organization and design: the hardware/software interface. 5th edition. Morgan Kaufmann.

Course title: English language

Course code: ENG116

Intended semester: (1)

Course duration: 15 weeks

Credit hours: 3(3+0)

Rationale:

This course is intended for students of medical laboratory sciences

Course objectives and learning outcomes:

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

1. Write and speak English fluently.
2. Identify the bases of English language grammar.
3. Define nouns, verbs, and adjectives and recognize combination between these items and syntax used in scientific writings.
4. Identify the infinitive, passive, and omission uses, and their combination with scientific syntax.
5. Use miscellaneous syntax in scientific writings.

Instruction methods:

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 80%
- Activities (Seminars ,Group discussion and Assignments):20%

Course contents:

Week (1) **Nouns 1**:

- Compound nouns
- Nouns with the same form as verbs
- Nouns+ of this king.
- Nouns+ ending in-ion, y, ance, -ence,-ment
- Nouns ending in - al,- or,-ability,-ability

Week (2) **Nouns 2:**

- Present, past participle+ noum
- That, those to replace nouns
- Of+ (adjective) noun
- That to replace singular noun

- Whose to replace plural nouns

Week (3) **Infinitive:**

- Was seen + infinitive
- Is said + infinitive
- Can be + past participle + infinitive, present participle
- Infinitive to replace so that, result that

Week (4) **Verbs:**

- Verbs formed with- fy, en-, en
- Verbs meaning show
- Verbs formed from nouns
- Has to replace other verbs
- On . . . . . ing to replace when + verb

Week (5) **Past participle**:

- Before being + past participle
- In, un before adjectives/ past participle
- Is said to have + past participle
- When / if past participle

Week (6) **Past and present participle:**

- Which + passive + to be + past participle
- Which + passive + to have + past participle
- P resent participle to replace which + verb
- Contraction of which + present
- Description of experiment (passive)

Week (7) **Passive**

- Passive with agent
- passive without agent
- Contraction of which + passive
- Negative passive + infinitive
- Passive + to have + past participle
- Passive summery writing

Week (8) **Adjectives**

- Adjective ending in - ar, - ic
- Adjective + enough + infinitive
- Is said to be + adjective
- Un-, in-, im-, ab- + adjective

Week (9) **Omission**

- Omission to avoid repetition
- Omission of preposition
- Omitting nous to avoid repetition
- Do, does , did to avoid repetition

Week (10) **Miscellaneous – 1**

- Known as
- On /after . . . . . .ing
- For . . . . . . .ing purpose
- Question word + ever

Week (11) **Miscellaneous – 2**

- provided with
- Able , unable to = can , cannot
- The case
- In that case
- BY that meant

Week (12) **Miscellaneous-**3

- Being showing result / reason
- Owing to the fact that
- And vice versa
- And vice versa
- Not . . . . . .But . . . . . .
- The former / The later

Week (13) **Miscellaneous-4**

- Of which to replace whose
- Having to replace which has, have
- The more .....the more .....
- By this is meant
- Although

Week (14) **Miscellaneous –**5

- Differ / worry
- The reason for . . . . . is that
- Due to the fact that
- If it were not for

Week (15) **Miscellaneous-6**

- Contraction of relative clause
- Phrase or clause to begin a sentence
- Possess to replace have
- Might to express doubt, possibility
- Summary writing

References:

- Azar B.S., Hagen S.A. (2016). Understanding and using English grammar. 5th edition. Pearson education ESL.
- Clarck R.P. (2008). Writing tools. 10th edition. Little, Brown and company.
- Garner B.A. (2016). Garner's modern English usage. 1st edition. New York: Oxford University press.

Course title: General physics

Course code: PHS117

Intended semester: (1)

Course duration: 15 weeks

Credit hours: 2(2+0)

Course description:

This course covers motion, work and energy, fluid Mechanics, wave motion, optics and thermal physics

Course objectives and learning outcomes:

1. To solidify the student's old knowledge of physics and provide them with the basic concepts of physics.
2. To improve the student's scientific English specially in the area of physics.
3. To provide the students with the standard conventions and units of measurement used world-wide today.
4. To teach the physics laws and theories those relate to medical area.
5. To equip the students with the thinking tools those help them be scientific persons.

Instruction methods:

- Lectures
- Practical
- Tutorials and assignments
- Seminars

Evaluation:

- Theory examination: 80%
- Continual evaluation or activities (Seminars ,Group discussion and Assignments): 20%

Course contents:

Week (1)	Basic concepts • What is Physics? • Basic Quantities Vs Derived Quantities • Units of Measurements (UOM)
Week (2)	Newton's Laws of motion • Primary definition of the force. • Newton's first laws of motion • Newton's Second Law
Week (3)	Newton's Laws of motion

	• Newton's Third Law • Examples of Some Forces. • Circular motion: Centripetal force and centrifuge • The weight : the gravitational force of the earth
Week (4)	Work and Energy • The work • Kinetic theory of work and energy • Conservation of energy • Potential energy • Other forms of energy • Transformation of energy
Week (5)	Fluid Mechanics • Fluids at rest: Density and specific gravity. • Fluids at rest: Pressure and the pressure Gauge
Week (6)	Fluid Mechanics • Fluids at rest: Pascal's principle. • Fluids in motion: Continuity Equation. • Fluids in motion: Bernoulli's Equation. • Medical Application: Measuring human blood pressure
Week (7)	Wave Motion • Characteristic of wave motion • Types of waves
Week (8)	Wave Motion • Energy transmitted by waves • Sound waves • Medical Application: Ultrasound Waves
Week (9)	Tutorial
Week (10)	Principles of Optics • Geometrical optics: Laws of reflection and refraction • Medical Application: Endoscopes
Week (11)	Principles of Optics • Geometrical optics: Mirrors and Thin Lenses
Week (12)	Principles of Optics • Optical Instruments: Magnifying glass and Microscope • Medical Application: The Physics of the human eye
Week (13)	Thermal physics • The Temperature and the Temperature Sales. • Thermometers.
Week (14)	Thermal physics • The Heat Quantity.

	• Changes of state. Thermal physics • Heat transfer
Week (15)	Tutorial

References:

- Adams S. (2000). Advanced physics. 1st edition. New York: Oxford University press
- Chapman C. Fundamentals of seismic wave propagation. 1st edition. Cambrige: Cambrige University press.
- Gupta M. (2016). Molecular spectroscopy. 1st edition. New Delhi: Campus books international.

اسم المنهج : الثقافة الإسلامية-1

رمز المنهج: سلم118

عدد الساعات المعتمدة: ثلاث ساعات

الفترة الدراسية: الفصل الأول

الفترة الزمنية للمنهج: 15 أسبوع

الأهداف العامة للمنهج:

عند إتمام دراسة المنهج ينبغي أن يكون الطالب قادرا على:

1. التعرف على خصائص الثقافة الإسلامية والعقيدة وعلاقة الإنسان بالكون

2. التعرف على أفاق الحضارة الإسلامية والإعجاز العلمي في الإسلام

3. التعريف على أساليب العلمانية ورأي الدين في الاستنساخ

الأهداف الخاصة للمنهج:

عند إتمام دراسة المنهج ينبغي أن يكون الطالب قادرا على :

1- تحقيق علاقة متينة بينة وبين ربه في كل عمل يقوم به

2- تزويد نفسه بجملة من المعارف الإسلامية التي تعينه على فهم الدين فهما مستنيراً واعياً

3- خلق إحساس متين في نفسه بأن الدين مرتبط بالعمل وبالنمط السلوكي للفرد المسلم الوقوف على التراث الإسلامي المتنوع والقدرة على فهمه واستيعابه والإفادة منه في الحياة الدنيا

طرق التدريس:

- محاضرات
- أنشطة (سمنارات، حلقات نقاش)

تقويم المقرر:

- امتحان تحريري: 80%
- أنشطة: 20%

<u>محتويات المنهج</u>

الأسبوع الأول: مفاهيم وخصائص الثقافة الإسلامية

الأسبوع الثاني: انحراف مسار الثقافة الإسلامية وأثرها هذا الانحراف

الأسبوع الثالث: مفهوم العقيدة الإسلامية وأركانها

الأسبوع الرابع: الصفات الواجبة والجائزة والمستحيلة في حق الله تعالى وفى حق الرسل

الأسبوع الخامس: علاقة الإنسان بالكون وبخالقه وبالمجتمع

الأسبوع السادس: تعريف الحضارة : روائع الحضارة الإسلامية

الأسبوع السابع: خصائص الحضارة الإسلامية في المجالات الطبية .

الأسبوع الثامن: تعريف العلمانية , نشأتها أثارها

الأسبوع التاسع: حقوق وواجبات الإنسان في القوانين الوضعية

الأسبوع العاشر: حقوق وواجبات الإنسان في الإسلام

الأسبوع الحادي عشر: الناحية العلمية للاستنساخ ومجالاته

الأسبوع الثاني عشر: رأي الدين مفصلاً في الاستنساخ

الأسبوع الثالث عشر: الإعجاز في أسلوب القران الكريم

الأسبوع الرابع عشر: الإعجاز العلمي في القران الكريم

الأسبوع الخامس عشر: الأعجاز العلمي في السنة النبوية الشريفة

المراجع:

- عمر سليمان الأشقر. (2003). نحو ثقافة اسلامية أصيلة. الطبعة الثانية. بيروت: دار النفائس.
- مصطفى مسلم. (2000). الثقافة الاسلامية. الطبعة الأولى. عمان: اسراء للنشر والتوزيع
- علي الطنطاوي. (1996). لثقافة الاسلامية. سوريا

Course title: Laboratory Calculations

Course code: CAL119

Credit hours: 3 (2+1)

Intended semester: (1)

Course duration: 15 weeks

Course description:
This course is designed to provide students with the knowledge and skills necessary to perform scientific calculations used in clinical laboratories. This includes calculating dilutions and solutions, graphing and chemistry formulae. The course will emphasize quality control and compliance principles in computing laboratory test results.

Course objectives:
By the end of this course, medical laboratory science students should:

1. Describe the organization of the number systems and their uses in clinical laboratories.
2. Discuss w/v or molar solutions.
3. Understand solutions with multiple components.
4. Appropriately prepare and use standards and reference stock solutions.
5. Sample for assay and dilutions necessary to fit in a sensitivity range.
6. Convert between different units using conversion factors and dimensional analysis.
7. Calculate molarity of a solution starting with pure solute or with a concentrated solution as well as explain how to prepare a solution of a given molarity.
8. Explain the properties of temperature and pressure including how these are measured and convert between different units for these properties.
9. Understand how to prepare appropriate standards and reference, given the volume and expected sensitivity range of a colorimetric assay.
10. Plot and interpret a standard curve.
11. Discuss use of biostatistics in clinical laboratories.

Instruction methods:

- Lectures
- Tutorials

Evaluation:

- Theory examination: 80%
- Tutorials: 20%

Course Content:

Week 1	Basic Mathematics (revision)
Week 2	Systems of Measure and temperature + Temperature conversion
Week 3	Rounding and the Significance of Figures
Week 4	Factors
Week 5	Dilutions
Week 6	Solutions calculations and expression of concentrations
Week 7	Exponential Notation and Logarithms
Week 8	Med term exam
Week 9	Ionic solutions
Week 10	Colorometry
Week 11	Graphs, Standard curves.
Week 12	Haematology Math (introduction)
Week 13	Clinical chemistry math (introduction)
Week 14	Biostatistics in laboratory sciences
Week 15	Quality control and method evaluation

Tutorials:

Week 1	Basic Mathematics (revision)
Week 2	Systems of Measure and temperature + Temperature conversion
Week 3	Rounding and the Significance of Figures
Week 4	Factors
Week 5	Dilutions
Week 6	Solutions calculations and expression of concentrations

Week 7	Exponential Notation and Logarithms
Week 8	Med term exam
Week 9	Ionic solutions
Week 10	Colorometry
Week 11	Graphs, Standard curves.
Week 12	Haematology Math (introduction)
Week 13	Clinical chemistry math (introduction)
Week 14	Biostatistics in laboratory sciences
Week 15	Quality control and method evaluation

References:

1- Laboratory Mathematics: Medical & Biological Applications
Publisher: Mosby; 5 edition (January 15, 1997) ,Language: English, ISBN-10: 0815113978 ,ISBN-13: 978-0815113973.

2- Fundamental Laboratory Mathematics: Required calculation for medical laboratory professional.
Lela Buckingham (2014). ISBN- 13:978-0-8036-2949-3. 416 pages paperback.

SEMESTER TWO

اسم المنهج : اللغة العربية II

رمز المنهج: عرب 121

الفترة الدراسية : الفصل الثاني

عدد الساعات المعتمدة : ثلاث ساعات

الفترة الزمنية للمنهج : 15 أسبوع

<u>الأهداف العامة للمنهج</u> :

عند إتمام دراسة المنهج ينبغي أن يكوم الطالب قادراً على :

1. معرفة أنواع وطرق النحت وقواعد التعريب والاختلافات بين اللغة العربية واللغة الإنجليزية في النبر

2. معرفة أسس التعريب والترجمة وما يتبع ذلك كتاريخ الترجمة وأهميتها وأنواعها وأساليبها .

3. معرفة إسهامات العلماء العرب في الحضارة والعلوم المختلفة.

4. معرفة المستويات الصوتية وأنواعها ودلالاتها .

الأهداف الخاصة للمنهج

عند إتمام دراسة المنهج ينبغي أن يكوم الطالب قادراً على:

1. مناقشة طرق النحت ، وأهمية الترجمة وتاريخها، ووحداتها وأنواعها ومستوياتها وجذورها عند العرب

2. معرفة قواعد الألفاظ والتعريب وإسهامات العلماء العرب في الحضارة والعلوم .

3. معرفة أنواع المستويات اللغوية كالمستوى الصوتي والنحوي والدلالي .

4. معرفة الاختلافات بين اللغتين العربية والإنجليزية في النبر .

طرق التدريس:

- محاضرات
- أنشطة (سمنارات، حلقات نقاش)

تقويم المقرر:

- امتحان تحريري: 80%
- أنشطة: 20%

<u>محتويات المقرر:</u>

الأسبوع الأول النحت : أنواع وطرق النحت

الأسبوع الثاني : الترجمة : تعريف وتاريخ الترجمة

الأسبوع الثالث : الترجمة : أهمية الترجمة

الأسبوع الرابع: الترجمة : الترجمة عند العرب

الأسبوع الخامس: الترجمة : وحدة الترجمة

الأسبوع السادس : الترجمة : الترجمة على مستوى الفونيم والمورفيم

الأسبوع السابع : الترجمة الترجمة على مستوى الكلمة والجملة

الأسبوع الثامن : الترجمة : الترجمة على مستوى العبارة والنص

الأسبوع التاسع : التعريب : قواعد تعريب الألفاظ

الأسبوع العاشر: إسهامات علماء العرب في الحضارة العربية

الأسبوع الحادي عشر: نبوغ العرب في العلوم المختلفة

الأسبوع الثاني عشر: المستويات اللغوية : المستوى الصوتي

الأسبوع الثالث عشر: المستويات اللغوية : المستوى النحوي

الأسبوع الرابع عشر: المستويات اللغوية : المستوى الدلالي

الأسبوع الخامس عشر: بعض الاختلافات بين الإنجليزية والعربية في النبر

المراجع:

- عباس محجوب محمود. (2016). تدريس مهارات اللغة العربية للكليات الطبية. الطبعة الأولى. الخرطوم: مطبعة جامعة النيلين.
- رشدي أحمد طعمية. (2004). المهارات اللغوية: مستوياتها، تدريسها. صعوباتها. الطبعة الأولى. القاهرة: دار الفكر العربي.
- فاضل صالح السامرابي. (2001). الجملة العربية: تأليفها وأقسامها. الطبعة الثانية. القاهرة: دار الفكر.

Course title: Biochemistry II

Course code: BCM122

Intended semester: (2)

Course duration: 15 weeks

Credit hours: 3(2+1)

Course objectives:

By the end of this course, medical laboratory student will be able to:

1. Discuss the process of carbohydrates absorption digestion, metabolism, and catabolism
2. Describe the process of Glucose oxidation, Glycolysis, Conversion of Pyruvate to Acetyl Co A
3. Describe TCA cycle
4. Discuss the process of lipids absorption digestion, metabolism, and catabolism
5. Discuss catabolism of amino acid and urea cycle and ammonia metabolism
6. Discuss conversion of amino acids to specialized products
7. Discuss catabolism of the carbon skeletons of amino acids
8. Describe catabolism of Purine and Pyrimidine Nucleotide

Instruction methods:

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities (Seminars ,Group discussion and Assignments):20%

Course contents:

Week (1)	Digestion and absorption of carbohydrates
Week (2)	Glucose oxidation, Glycolysis, Conversion of pyruvate to Acetyl CoA, and TCA cycle
Week (3)	Gluconeogenesis
Week (4)	Glycogen metabolism and pentose phosphate pathway
Week (5)	Metabolism of hexose sugars
Week (6)	Oxidation of fatty acids
Week (7)	Cholesterol metabolism(include lipoprotein and bileacid andsalt metaboilsm)

Week (8)	Fatty acids synthesis (Lipogenesis)
Week (9)	Phospholipids metabolism
Week (10)	Eicosanoids metabolism
Week (11)	Digestion and absorption of protein
Week (12)	Biosynthesis of the nutritionally nonessential amino acids
Week (13)	Catabolism of of amino acid and urea cycle and ammonia metabolism Conversion of amino acids to specialized products
Week (14)	Catabolism of the carbon skeletons of amino acids
Week (15)	Metabolism of Purine and Pyrimidine Nucleotide

Practical:

Week (1)	Orientation
Week (2)	Calculation of buffers and solutions
Week (3)	Pipetting skills
Week (4)	Detection of vitamins
Week (5)	Starch hydrolysis by amaylase enzyme
Week (6)	Effect of temperature on enzyme activity
Week (7)	Effect of PH on enzyme activity
Week (8)	Effect of substrate concentration and enzyme concentration on enzyme activity
Week (9)	Tutorial
Week (10)	Detection of specific Amino acids
Week (11)	Theory of cellular fractionation and detection of mitochondrial pellet through succinate dehydrogenase enzyme detection using DCIP.
Week (12)	Blood plasma proteins
Week (13)	Protein characterization methods
Week (14)	Detection of bile acids
Week (15)	Tutorial

References:

- Champe P.C., Harvey R.A., Ferrier D.R. (2005). Biochemistry. 3rd edition. USA: Lippincott Williams & Wilkins.
- Campbell P.N., Smith A.D., Peters T.J. (2005) Biochemistry illustrated. 5th edition. Philadelphia: Elsevier limited.
- Elliot W.H, Elliot D.C. (2006). Biochemistry and molecular biology. 3rd edition. New York: Oxford University press.

Course title: English medical terminology

Course code: ENG123

Intended semester: (2)

Course duration: 15 weeks

Credit hours: 3(3+0)

Course objectives:

1. By the end of this course, medical laboratory students should be able to:
2. Develop reading and writing skills and give the structure expected to come across while probing for more information in scientific books.
3. Increase their vocabulary in order to increase the store of scientific terms that help them to read English language books.
4. Define the medical terms related to compartments of the body, anatomy, histology, and cell structure, in addition to Know the application of English language, information transfer, and guided writing.
5. Define the medical terms related the heart, nervous system, and reproduction, as well as, the application of English language, information transfer, and guided writing

Instruction methods:

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 40%
- Practical examination: 50%
- Continual evaluation or activities (Seminars ,Group discussion and Assignments):10%

Course contents:

Week (1)	Compartment of the body-1 • Reading and comprehension • Use of language
Week (2)	Compartment of the body • Information transfer • Guided writing
Week (3)	Anatomy of the trunk-1 • Reading and comprehension • Addition and elimination reactions.
Week(4)	Anatomy of the trunk-2 • Information transfer

	• Guided writing
Week (5)	Epithelial tissue-1 • Reading and comprehension • Use of language
Week(6)	Epithelial tissue-2 • Information transfer • Guided writing
Week (7)	Cell structure-1 • Reading and comprehension • Use of language
Week (8)	Cell structure-2 • Information transfer • Guided writing
Week (9)	The heart-1 • Reading and comprehension • Use of language
Week (10)	The heart-2 • Information transfer Guided writing
Week (11)	The nervous system-1 • Reading and comprehension • Use of language
Week (12)	The nervous system-2 • Information transfer • Guided writing
Week (13)	Reproduction-1 • Reading and comprehension • Use of language
Week (14)	Reproduction-2 • Information transfer • Guided writing
Week (15)	Summery & exercises • Use of language • Essay writing

References:

- Clarck R.P. (2008). Writing tools. 10th edition. Little, Brown and company.
- Garner B.A. (2016). Garner's modern English usage. 1st edition. New York: Oxford University press.
- Willis M.C. (2008). Medical terminology: a programmed learning approach to the language of health care. 1st edition. Philadelphia: Lippincott Williams & Wilkins.

اســم المنـهج: الثقافة الإسلاميةII

رمز المنهج: سلم124

الفترة الدراسية : الفصل الثاني

عدد الساعات المعتمدة: ثلاث ساعات

الفترة الزمنية للمنهج : 15 أسبوع

<u>أهداف المنـهج:</u>

عند إتمام دراسة المنهج ينبغي أن يكون الطالب قادراً على :

1. التعرف على أهمية الأخلاق والعلم والإيمان في الحياة1.
2. التعرف على رأى الإسلام في المستجدات الحديثة ودور تقني المختبرات الطبية في المجتمع الإسلامي 2 .
3. معرفة فقه الجنائز والتعرف الديني للموت مقروناً مع علم التشريح .3 .
4. معرفة الموقف الفقهي والرأي الديني من نقل وزراعة الأعضاء ، نقل الدم ، منع الحمل والإجهاض والتلقيح الاصطناعي

طرق التدريس:

- محاضرات
- أنشطة (سمنارات، حلقات نقاش)

تقويم المقرر:

- امتحان تحريري: 80%
- أنشطة: 20%

<u>محتويات المنـهج</u>:

الأسبوع الأول: الإيمان والعقل والعلم والعمل

الأسبوع الثاني - مفهوم الأخلاق في الإسلام وأهميتها في الحياة الإنسانية.

الأسبوع الثالث: أهمية الأخلاق في ممارسة المهن الطبية المختلفة .

الأسبوع الرابع: مواصفات المسلم الذي يعمل في مجلات المهن الطبية المختلفة .

الأسبوع الخامس: التعرف بالموت والمفهوم الديني للموت والسكتة الدماغية .

الأسبوع السادس : الاحتضار، تلقين الشهادة ، غسل الميت وصلاة الجنازة .

الأسبوع السابع : تعريف علم التشريح وأغراضه.

الأسبوع الثامن : إسهامات الثقافة الإسلامية في علم التشريح.

الأسبوع التاسع: نظرة الإسلام إلى نقل و زراعة الأعضاء

الأسبوع العاشر: الموقف الفقهى من نقل الدم .

الأسبوع الحادي عشر: موقف الشريعة الإسلامية من الإجهاض

الأسبوع الثاني عشر: راي الدين في وسائل منع الحمل وتنظيم الأسرة

الأسبوع الثالث عشر: الموقف الفقهي من التلقيح الاصطناعي بأنواعه المختلفة

الأسبوع الرابع عشر: رأي الدين في أطفال الأنابيب

الأسبوع الخامس عشر: دور تقني المختبرات الطبية في المجتمع الإسلامي

المراجع:

- عمر سليمان الأشقر. (2003). نحو ثقافة اسلامية أصيلة. الطبعة الثانية. بيروت: دار النفائس.
- مصطفى مسلم. (2000). الثقافة الاسلامية. الطبعة الأولى. عمان: اسراء للنشر والتوزيع
- علي الطنطاوي. (1996). لثقافة الاسلامية. سوريا

Course title: Cell biology

Course code: CBG125

Credit hours: 3(2+1)

Intended semester: (2)

Course duration: 15 weeks

Course description:

This course covers the structure and functions of cells and cell organelles and, cell to cell communication, cell division, cell genetic materials, and protein synthesis, as well as mutation definition, types, and inheritance.

Course objectives:

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

1. Recognize the great diversity of all cellular form and function.
2. Identify the molecular mechanisms of cell metabolism, growth, division, and communication.
3. Discuss the important features and functions of the cell nucleus as they relate to gene organization, DNA replication, protein synthesis and regulation of cell division.
4. Demonstrate the structure and main functions of all of the major organelles in eukaryotic cells.
5. Define the designation of the cell as the unit of life by studying its functions.
6. Describe how cellular organelles communicate with each other.
7. Identify the molecular structure of the major biomolecules that comprise cells.
8. Recognize DNA as the genetic material, mainly DNA replication, cell division, protein synthesis, mutation and inheritance.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	• Introduction • Properties of living things classification: prokaryotes and eukaryotes
Week (2)	• Cell Structure and Function • Prokaryotic and Eukaryotic cells: Animals and Plants Structure of the plasma membrane
Week (3)	Cell Structure and Function • The Nucleus (chromosomes; nucleoli; nuclear membrane) • Cytoplasmic organelles enclosed by a plasma membrane
Week(4)	Cell Structure and Function • Ribosomes • Energy related organelles-(chloroplasts and mitochondria)
Week (5)	Cell Structure and Function • Cytoskeleton (microtubules and microfilaments) • Membrane attachment between cells, communication between cells
Week(6)	Macromolecules • Proteins structural organization and functions
Week (7)	Macromolecules • Carbohydrates & Lipids
Week (8)	Thermodynamics & Bioenergetics • Energy Transformations • Transferring Energy in Cells: Endergonic and Exergonic Reactions • ATP and ADP (phosphorylation and dephosphorylation
Week (9)	Transport across cell membranes • Vesicle trafficking • Endocytosis • Exocytosis • Phagocytosis
Week (10)	Transport across cell membranes • Transport of small molecules across membranes
Week (11)	Signaling at the Cell Surface Signal transduction: Overview
Week (12)	The Cell Cycle Regulating the Eukaryotic Cell Cycle • Mitosis
Week (13)	The Cell Cycle • Meiosis
Week (14)	Molecular Genetics Mechanisms • DNA the genetic material. • DNA Replication, and Transcription
Week (15)	Molecular Genetics Mechanisms • RNA and protein synthesis.

Week (1)	Laboratory safety
Week (2)	Types of microscope.
Week (3)	Parts of the microscope
Week(4)	How to use the microscope
Week (5)	Types of cells: prokaryotic and Eukaryotic cells: Animals and Plants
Week(6)	Microscope of cell (Prokaryotic and Eukaryotic cells) I
Week (7)	Microscope of cell (Prokaryotic and Eukaryotic cells) II
Week (8)	Mid exam.
Week (9)	Cell division (Mitosis)
Week (10)	Human Karyotype.
Week (11)	Genetic disorders
Week (12)	Quantitive experiment .1 (Carbohydrates)
Week (13)	Quantitive experiment .2 (Proteins)
Week (14)	Quantitive experiment .3 (lipids)
Week (15)	Introduction to molecular techniques

References:

- Elliot W.H, Elliot D.C. (2006). Biochemistry and molecular biology. 3rd edition. New York: Oxford University press.
- Hawkins J.D. (2000), Gene structure and expression. 3rd edition. Cambridge: Cambridge university press.
- Starr C, Taggart R, Evers C, Starr L (2013). 13th edition. Cell biology and genetics: the unity and diversity of life. New York: cengage learning

Course title: Histology

Course code: HST126

Intended semester: (2)

Course duration: 15 weeks

Credit hours: 4(2+2)

Course description:

This course will provide the students with the basic knowledge of the theoretical and applied aspects of cells and tissues that form the organs of human body. This course will also cover the four basic tissues; their function, and gross as well as microscopic appearance of organs of the human body such as: nervous system, circulatory system, lymphatic system, respiratory system, digestive system, urinary system and reproductive system.

Course objectives:

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

- Recognize the major differences between different human organs and tissues considering anatomy and histology.
- Identify anatomy, histology, and physiology of the cell, basic Tissue types.Musculo-skeletal system, .Cardiovascular system. Respiratory System, Skin, Immune system, Digestive system.Urinary System, Male and Female reproductive systems, Nervous system, Endocrine system, Body Cavities and their fluids.

Instruction methods:

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Continual evaluation or activities (Seminars , Group discussion and Assignments):20%

Course Contents:

Week (1)	The Cell: Structure and Functions.
Week (2)	Basic Tissue- Types-I (Epithelium).
Week (3)	Basic Tissue- Types-II (Connective Tissue, Cartilage, blood and Bone).
Week(4)	Basic Tissue Types-III (Muscle, and Nervous Tissue).
Week (5)	Digestive System-I: oral cavity
Week(6)	Digestive System-II: Gastro intestinal tract

Week (7)	Digestive System-III: accessory organs(liver, pancreas, salivary glands)
Week (8)	Tutorial
Week (9)	Cardiovascular System.
Week (10)	Respiratory System (trachea and lung)
Week (11)	Urinary system (kidney, and ureters).
Week (12)	Male reproductive system
Week (13)	Female reproductive system, ovary, uterus, and breast.
Week (14)	Lymphatic and integumentary system(spleen, lymph node and skin)
Week (15)	Tutorial

Practical:

Week (1)	I	Introduction (lab sessions instructions , dealing with microscope,)
	II	Epithelium (types and location of simple epithelia)
Week (2)	I	Epithelium (types and location of stratified epithelia)
	II	Connective Tissue.(connective tissue proper , cartilage, Blood, Lymphatic vessels and bone)
Week (3)	I	Nervous tissue
	II	Cardiac muscle
Week(4)	I	Skeletal and smooth muscle
	II	Tongue and salivary gland
Week (5)	I	Thyroid gland
	II	Esophagous and stomach
Week(6)	I	Small intestine
	II	Large intestine
Week (7)	I	Liver and pancreas
	II	Gall bladder
Week (8)	I	Tutorial
	II	Kidney
Week (9)	I	Ureters
	II	Bladder
Week (10)	I	Tutorial
	II	Male reproductive system- testis
Week (11)	I	Female reproductive system-ovary
	II	Female reproductive system-uterus
Week (12)	I	Breast
	II	Tutorial
Week (13)	I	Respiratory Tract- trachea
	II	Lung
Week (14)	I	Skin
	II	Lymph nodes
Week (15)	I	Spleen
	II	Tutorial

References:

- Kierszenbaum A.L. (2007). Histology and cell biology: an introduction to pathology. 2nd edition. Philadelphia: Elsevier limited.
- Prasad S.R. (2011). Practical histology for medical students. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Singh I. (2010). Textbook of human histology. 6th edition. New Delhi: Jypee brothers medical publisher (P) Ltd.

Course title: Laboratory safety

Course code: SFT127

Intended semester: (2)

Course duration: 15 weeks

Credit hours: 2(2+0)

Course description:

The course includes an overview of the field of medical laboratory technology. Familiarization with laboratory safety, safe laboratory design and also include basic laboratory specimen collection techniques and safety are introduced.

Course objectives and learning outcome:

By the end of course the student will be able to:

1. Demonstrate knowledge of laboratory safety and infection control.
2. Emphasize on the proper handling of clinical specimens.
3. List the major type of laboratory hazards.
4. Describe the proper procedures for handling accidents.
5. Perform vein punctures and finger sticks in a professional manner.
6. Discuss the common laboratory hazards to include:-
7. Chemical, Fire, Biological, Mechanical, Electrical.
8. Describe the proper storage and handling of dangerous chemicals and reagents used in the lab.
9. Describe the proper procedure for handling accidents.
10. Identify the basic procedures followed in infection control.
11. Define the major types of laboratory hazards, giving example of each type.
12. Obtain a blood specimen including: Approaching the patient, Equipment to be used, Selecting and preparing the puncture site, Performing the puncture, Listing precautions to be observed., Explain the proper use of vacuum tube.
13. Describe the common types of anticoagulants, how they work and when they be used.
14. Perform a vein puncture by vacationer method and a finger puncture under the guidance of the instructor.
15. Explain methods of sterilization and demonstrate the proper method for handling and disposing of biological hazards.
16. Describe equipment available in the laboratory used for safety.
17. Describe basic first aid procedures.
18. Explain the appropriate local safety procedures.
19. Explain and practice laboratory specimen collection techniques
20. Perform basic laboratory specimen collection techniques and safety rules, including Phlebotomy.

21. Demonstrate protocols used in identification of specimens and the procedures used to maintain accurate patient identity.
22. Discuss complication encountered in specimen collection
23. Select an appropriate method of resolving problems of specimen collection, storage in a safety way.

Instruction methods:

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 40%
- Practical examination: 50%
- Continual evaluation or activities (Seminars, Group discussion and Assignments):10%

Course Content:

Week (1)	Type of laboratories
Week (2)	Introduction to laboratory safety (General regulation)
Week (3)	Laboratory hazards Chemical, Fire
Week(4)	Laboratory hazards Biological, Mechanical, Electrical
Week (5)	Local safety procedures
Week(6)	Safe laboratory design
Week (7)	Safety in hematology lab & Safety in clinical chemistry lab
Week (8)	Tutorial
Week (9)	Safety in immunohematology and blood bank
Week (10)	Safety in microbiology lab & Safety in parasitology lab
Week (11)	Safety in histopathology & cytology lab
Week (12)	Laboratory safety and infection control
Week (13)	Handling and disposing of biological hazards
Week (14)	Storage and handling of dangerous chemicals
Week (15)	Tutorial

- Cheesbrough, M. Distinct Laboratory Manual in tropical countries. (2008). Revised 2nd edition. Cambridge: Cambridge University press.
- Gracia L.S. (2014). Clinical laboratory management. 2nd edition. Wasgington: American society of microbiology.
- John R. Snyder and Donald A. Senhauser. Administration and supervision in laboratory medicine. 2nd edition. J.B. Lippincott company, Philadelphia

Course title: Physiology

Course code: PHYS128

Credit hours: 3(2+1)

Intended semester: (1)

Course duration: 15 weeks

Course description:
This course provides basic background to the principal physiological systems of the human body.

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

1. State the role of the different body systems in regulating the internal environment
2. Integrate information about various body systems and describe how one system impacts the other systems.
3. Describe abnormalities in body systems
4. Predict how abnormalities affect homeostasis and how the body attempt to compensate for the abnormalities.

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Course contents:

Week (1)	Introduction to human physiology: • The internal environment and homoeostasis • Membrane biophysics and temperature
Week (2)	Body fluids
Week (3)	Haemopoiesis: red blood cells
Week (4)	Haemopoiesis: White blood cells & Plateletss
Week (5)	Blood group systems and plasma proteins
Week (6)	Nervous system

Week (8)	Cardiovascular system
Week (9)	Respiratory system
Week (10)	Digestive system-1
Week (11)	Digestive system-2
Week (12)	Urinary system
Week (13)	Acid- base balance
Week (14)	Endocrine system-1
Week (15)	Reproductive system

Practical	
Week (1)	Orientation
Week (2)	Body fluid analysis-1
Week (3)	Body fluid analysis-2
Week (4)	Haemopoietic cell morphology
Week (5)	Haemoglobin estimation
Week (6)	Haemocytometry
Week (7)	Blood cell count-1
Week (8)	Blood cell count-2
Week (9)	Blood cell count-3
Week (10)	Blood grouping-1
Week (11)	Blood grouping-2
Week (12)	Heart beats
Week (13)	Blood pressure
Week (14)	Lung function test
Week (15)	Acid base balance

References:

- Costanzol L.S. (1998). Physiology. 2nd edition. Maryland: Lippincott Williams & Wilkins
- Ganong W.F. (2005). Review of medical physiology. 21st edition. Middle East edition: McGraw Hill.
- Hall J.E. (2011). Guyton and Hall textbook of medical physiology. 12th edition. Philadelphia: Elsevier.

اسم المقرر : الدراسات السودانية

رمز المقرر: سود 129

الساعات المعتمدة: ساعتان

الفصل الدراسي: الثاني

الفترة الزمنية للمقرر: 15 أسبوع

وصف المقرر:

هذا المقرر يزود الطالب بمعلومات عن جغرافيا وتاريخ السودان القديم والحديث والعادات والتقاليد السودانية ويجعله ملماً بالثقافات المختلفة في المجتمع السوداني.

أهداف المقرر:

عند إتمام دراسة المنهج ينبغي أن يكون الطالب قادرا على:

1- مناقشة الاوضاع التاريخية، الجغرافية، العسكرية، الاقتصادية، لاجتماعية، والسياسية للسودان
2- إلتعرف على الحقب التاريخية والحضارات السودانية (مروي ، علوة ، المقرة ، مملكة الفونج ، مملكة سنار ، مملكة الفور)
3- الالملم ببعض العادات السودانية ومعرفة مدي تاثير العادات السالبة ومحاربة تلك العادات الضارة

طرق التدريس:

- محاضرات
- سمنارات
- مجموعات نقاش

تقويم المقرر:

- امتحان تحريري: 80%
- أنشطة: 20%

محتويات المقرر:

الأسبوع الأول	مقدمة في الدراسات السودانية
الأسبوع الثاني	جغرافيا السودان
الأسبوع الثالث	الموارد الطبيعية في السودان
الأسبوع الرابع	تسلسل الحقب التاريخية والحضارات السودانية

الأسبوع الخامس	تاريخ الحضارات السودانية: مملكة مروي
الأسبوع السادس	تاريخ الحضارات السودانية: مملكتي علوة والمقرة
الأسبوع السابع	تاريخ الحضارات السودانية: مملكة الفونج
الأسبوع الثامن	تاريخ الحضارات السودانية: مملكة سنار
الأسبوع التاسع	تاريخ الحضارات السودانية: مملكة الفور
الأسبوع العاشر	تاريخ السودان الحديث: الحركات الوطنية واستقلال السودان
الأسبوع الحادي عشر	تاريخ السودان الحديث: الحكومات المتعاقبة في السودان
الأسبوع الثاني عشر	تاريخ العلاقات الخارجية للسودان
الأسبوع الثالث عشر	الثقافة السودانية
الأسبوع الرابع عشر	العادلت والتقاليد السودانية
الأسبوع الخامس عشر	الأوضاع الاقتصادية والاجتماعية في السودان

المراجع:

الدراسات السودانية. المؤلف: د. اشراقة بشير. الناشر: المثالية, الخرطوم.

SEMESTER THREE

Course title: Basic Immunology

Course code: IMN231

Credit hours: 2(2+0)

Intended semester: (3)

Course duration: 15 weeks

Course description:

This course provide basic information about body defense mechanisms, mainly covers the immune system, complement system, immune response, types of immunity, and antigen antibody reactions.

Course objectives:

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

1. Define medical terms related to immunity and the immune response
2. Recognize the types of immunological organs and tissues associated with the immune system
3. Numerate the functions of lymphoid cells, phagocytic cells, phagocytoses and non –T non-B cells
4. Recognize the basis of lymphokines, cytokines, antigens, antibodies and humoral immunity
5. Identify the general concepts of T-cell activation, cellular immunity, complement system, MHS, and HLA.
6. Discuss the principles and procedures of immunological techniques.

Instruction methods:

- Lectures
- Tutorials and seminars
- Assignments

Evaluation:

- Theoretical examination: 80%
- Activities: 20%.

Course contents:

Week (1)	Introduction to immunology: • Definitions and historical background • Function of immune system
Week (2)	Innate immunity: • Natural immunity's determinants • Natural immunity's factors
Week (3)	Acquired immunity: • Recognition ,specificity and memory • Types (Primary & secondary immune response)
Week (4)	Antigens and immunogens: • Antigenic determinants • Factors affecting immunogenicity
Week (5)	• Anatomy and physiology of the immune system • Primary and secondary immune system • Cell involved in the immune system
Week (6)	Immunoglobulins (Igs): • Isotopes and subclasses • Structures and functions
Week (7)	Cell cooperation: • Principles of cells interaction • T-cell and B-cell receptors
Week (8)	Major histocomtibility: • Classes and structures • Genomic organization of MHC and disease association
Week (9)	Regulation of the immune response: • T-cell defense mechanisms (Dependent & independent) • Role of macrophage and Cytokines' network
Week (10)	Complement –1: • Classical pathway activation • Alternative pathway activation

Week (11)	Complements-2: • Classical pathway activation • Alternative pathway activation
Week (12)	Complement-3: • Functions • Control of activity
Week (13)	Primary Ag-Ab interaction: • Agglutination • Preciptation
Week (14)	Secondary Ag-Ab interaction: • RIA & IFT • ELISA
Week (15)	Tutorial

References:

- Abbas A.K., Lichtman A.H. (2006-2007). Basic immunology: functions and disorders of the immune system. updated edition. Philadelphia: Elsevier
- Mohanty S.K., Leela K.S. (2014). Textbook of immunology. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Rich R.R. (2001). Clinical immunology. 2nd edition. London: Mosby international Ltd.
- Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: Basic Haematology

Course code: HEM232

Credit hours: 3(2+1)

Intended semester: (3)

Course duration: 15 weeks

Course description:

This is an introductory course to haematology provides the students with basic information about blood cell production, characteristics, functions, kinetics, and morphological features, as well as, ABO and Rhesus blood groups system and normal haemostatic system.

Course o**bjectives:**

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

1. Describe blood constituents, functions and properties.
2. Define haematopoiesis and describe haemopoietic sites according to developmental stages.
3. Define haemopoietic growth factors and describe their actions.
4. Define erythropoiesis and identify different erythropoiestic stages, substances needed for erythropoiesis.
5. Describe red ell metabolic pathways.
6. Describe red cell membrane structure.
7. Describe hemoglobin structure, types, synthesis and Genetic regulation of haemoglobin synthesis.
8. Numerate and describe different leucopoietic stages.
9. Identify the Functions, kinetic and morphological features of normal mature leukocytes.
10. Define the structure and morphological features of normal erythrocytes in bone marrow and peripheral blood picture.
11. Define thrombopoiesis, and identify different thrombopoietic stages and morphological features of individual megakaryocyte.
12. Describe the process of platelet production and platelet body distribution.

13. Recogne the ABO and Rh antigens and antibodies.
14. Perform ABO and Rh(D) grouping as well as D^u method.
15. Define the components and functions of hemostasis and describe the process of formation of primary and secondary haemostatic plug.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to haematology: • Haematology definition and branches • Blood (definition, constituents, functions and properties)
Week (2)	Haematopoiesis: • Definition • Sites according to developmental stages • Types and prosperities of haemopoietic stem cell • Structure of bone marrow microenvironment • Haemopoietic growth factors
Week (3)	Erythropoiesis: • Definition • Substances needed • Erythropoietin • Erythropoiestic stages • Regulation of erythropoiesis

	• Function and morphology of mature erythrocyte
Week (4)	Haemoglobin: • Haemoglobin structure and types • Synthesis • Genetic regulation of haemoglobin synthesis • Haemoglobin functions • Haemoglobin breakdown
Week (5)	Structure and morphological features of normal erythrocyte: • Red blood cell membrane composition • Structure -function relationship • Red blood cell deformability • Morphological features of normal erythrocyte
Week (6)	Red blood cell metabolism**:** • Pentose phosphate pathway • Embden-Meyerhof pathway
Week (7)	Leucopoiesis: • Definition • Stages • Growth factors and regulation of leucopoiesis
Week (8)	White blood cells: • Types and classification • Functions and kinetic • Morphological features of normal mature leucocytes

Week (9)	Thrombopoiesis: • Definition • Stages • Morphological features of individual megakaryocyte • Platelet production and Body distribution • Regulation of thrombopoiesis and platelet production
Week (10)	Introduction to Immunohaematology: • Definition of immunohaematology • Blood transfusion • Blood groups • ABO blood group antigens and antibodies • ABO grouping
Week (11)	Introduction to Immunohaematology: • Rhesus (Rh) blood group antigen and antibodies • Rh grouping • D^u method
Week (12)	Introduction to haemostasis: • Definition, components and functions of haemostasis • Formation of primary haemostatic plug
Week (13)	Introduction to haemostasis: • Formation of secondary haemostatic plug • Regulation of coagulation
Week (14)	Fibrinolytic system: • Plasminogen • Plasminogen activators • Plasminogen inhibitors • Fibrin degradation
Week (15)	Tutorial

Practical:

Week (1)	Introduction to haematology laboratory
Week (2)	Identification of laboratory glassware and equipments
Week (3)	Basic laboratory skills
Week (4)	Preparation of reagents
Week (5)	Blood film spreading
Week (6)	Blood film staining and examination
Week (7)	Morphological features of erythropoietic series
Week (8)	Morphological features of leucopoietic series
Week (9)	Morphgical features of thrombopoietic series
Week (10)	ABO grouping (slide method)
Week (11)	ABO grouping (tube method)
Week (12)	Rh(D) grouping
Week (13)	D^U method
Week (14)	Bleeding time
Week (15)	Clotting time

References:

1. Bain B.J., Bates I., Laffan M.A.(2016). Dacie and Lewis practical Haematology, 12th edition.Philadelphia: Elsevier limited.
2. Hoffbrand A.V., Moss P.H.A., Pettit J.E. (2006). Essential Haematology. 5th edition. Massachusetts: Blackwell publishing Ltd.
3. Hillyer C.D. Siberstein L., Ness P.M. Anderson K.C, Roback J.D. (2009). Blood banking and transfusion medicine: basic principles and practice. 2nd edition. New Delhi: Elsevier Inc.
4. Steine-Martin E.A., Lotspeich-Steininger C.A., Koepke J.A. (1998). Clinical Haematology: principles, procedures, correlation. 2nd edition. Philadelphia: Lippincott-Raven publishers.

Course title: Basic Histopathological techniques

Course code: HST233

Credit hours: 3(2+1)

Intended semester: (3)

Course duration: 15 weeks

Course description:
This course covers the different methods applied for preparation of biopsy for histopathological examination, types, aims, purposes of fixation and common fixing agents. The course will also describe the steps of tissue processing, microtome types and using, and the different methods of coloration used in histology.

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

1. Recognize the general aspects and the general principles of the pre-analytical phase for histopathology laboratory methods
2. Perform the initial processes intended to ensure the quality of the histopathological techniques.
3. Perform the different methods used for preparation of cells and tissues for microscopy
4. Discuss the aims of fixation and the different fixatives used for preservation of cells and tissues components
5. Recognize the principles, methods and the fluids used for decalcification of bones and calcified tissues.
6. Discuss the principles, aims, factors, stages and the different solutions used in tissue processing.
7. Discuss the types of microtome and how to cut thin section in microtome
8. Describe the applications and types of frozen techniques.
9. Discuss the different methods used for coloration of tissues sections
10. Discuss the types of routine staining (haematoxylin and eosin) and discuss the most important mounting medium that can be applied to the stained sections

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%

- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to the Histopathology Laboratory
Week (2)	Methods of preparation (direct examination, cytological preparation, sectional methods and methods of examination (non staining methods)
Week (3)	Fixation (definition, aim, effect), and tissue fixatives (simple and compound).
Week (4)	Cytological Fixatives, classification and factors affect fixation
Week (5)	Decalcification (principle, methods, factors, detection of endpoint of decalcification)
Week (6)	Tissue processing (reception, dehydration, clearing).
Week (7)	Tissue processing (impregnation, and embedding media)
Week (8)	Mid-Term Exam.
Week (9)	Microtomy (principle, types of microtome, sections cutting)
Week (10)	Frozen section(definition, application, types)
Week (11)	Theory of stain (aim, principle of staining)
Week (12)	Methods of coloration(tissue- dye complexes, vital staining, elective solubility, staining by the chemical production of colored substances in the tissues and metallic impregnation)
Week (13)	Haematoxylin(types, principles,alum and iron haematoxylin)
Week (14)	Haematoxylin and eosin and mounting media(resinous and aqueous mounting media)
Week (15)	Tutorial
Practical:	
Week (1)	Introduction: Orientation to histopathology laboratory, and lab safety in histopathology

Week (2)	Identification of different instruments and solutions in histopathology laboratory
Week (3)	Tutorial: methods of preparation and examination
Week (4)	Preparation of fixatives (simple histological, compound fixative and cytological fixative).
Week (5)	Decalcification and detection of the end point of decalcification
Week (6)	Revision: microscopic slide
Week (7)	Selection of biopsy specimen, and manual tissue processing
Week (8)	Embedding
Week (9)	Embedding
Week (10)	Microtomy-1
Week (11)	Microtomy-2
Week (12)	Staining with Mayer's Haematoxylin (progressive).
Week (13)	Staining with Harri`s Haematoxylin (regressive)
Week (14)	Staining with Weather's Haematoxylin
Week (15)	Tutorial

References:

- Prasad S.R. (2011). Practical histology for medical students. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Suvarna K., Layton C., Bancrofti J.D. (2012). Bancrofti's Theory and practice of histological techniques. 7th edition. London: Churchill Livingstone.
- Young B. Stewart W., O'Dowd G. (2009). Wheather's basic pathology: a text, atlas, and review of histopathology. 5th edition. London: Chuchill Lvingstone.

Course title: Basic Microbiology

Course code: MCR234

Credit hours: 3(2+1)

Intended semester: (3)

Course duration: 15 weeks.

Course description:

This course provides the student with information about bacterial cell structure, classification, bacterial growth and its role in infectious diseases, as well as specimens collection and sterilization methods.

Course objectives:

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

1. Identify the basic features and nature of bacteria and other microorganisms.
2. Identify the morphology, classification, growth, and nutrition of bacteria.
3. Practice how to sterilize and disinfect glassware and materials used in the laboratories.
4. Recognize the type of normal bacterial body flora, the pathogenicity of microorganisms, and transmission.
5. Practice how to collect and transport microbiology specimens.

Instruction methods:

- Lectures
- Practical
- Tutorials

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to medical microbiology: • Definition of microbiology & related terms

	• General feature of microorganisms • Classification of medical microorganisms and Bacterial morphology
Week (2)	Bacterial structure 1: • Essential structure (cell wall, cell membrane, mesosome, nuclear body & cytoplasm.)
Week (3)	Bacterial structure 2: • Other structure: flagella, pili, spore &capsule
Week (4)	Bacterial nutrition and growth requirements: • Physical & chemical nutritional factors
Week (5)	Bacterial genetics and reproduction: • Definition of DNA, replication & genetic variation
Week (6)	Sterilization: • Dry heat and moist heat.
Week (7)	Sterilization: • Radiation and filtration).
Week (8)	Disinfectants: • Strong and mild.
Week (9)	Tutorial
Week (10)	Normal body flora: • Definition, classification and it's medical role
Week (11)	Pathogenic bacteria:
Week (12)	Pathogenicity and pathogenesis of bacteria: • Definition, affecting factors and disease processing
Week (13)	Communicable disease: • Aetiology, types and feature.
Week (14)	Collection, transport and storage of clinical specimens: • Sterile specimens.
Week (15)	Collection, transport and storage of clinical specimens: • Non sterile specimens

Practical:	
Week (1)	Audio-visual demonstration: Medical microbiology.
Week (2)	Audio-visual demonstration: Classification of medical microorganisms
Week (3)	Audio-visual demonstration: Bacterial morphology
Week (4)	Audio-visual demonstration: Bacterial structure
Week (5)	Audio-visual demonstration: Bacterial nutrition and growth requirements
Week (6)	Audio-visual demonstration Bacterial genetics and reproduction

Week (7)	Sterilization: dry heat
Week (8)	Sterilization: moist heat
Week (9)	Sterilization by radiation filtration
Week (10)	Disinfection
Week (11)	Tutorial: Bacterial morphology and structure.
Week (12)	Audio-visual demonstration of bacterial pathogenesis.
Week (13)	Tutorial: Early history in microbiology.
Week (14)	Collection, transport and storage of clinical specimens(Sterile specimens)
Week (15)	Collection, transport and storage of clinical specimens(Non **s**terile specimens)

References:

- Brook G. F., Butel J., Ornston L., Jawetz E., Melnick J., Adelberg E. (2007). Medical Microbiology. 20th edition. California: Appleton and long.
- Cheesbrough, M. Distinct Laboratory Manual in tropical countries. (2008). Revised 2nd edition. Cambridge: Cambridge University press.
- Collee J. G., Marmion B. P., Fraser A. G.; Simmons A. (2007). Mackie and McCarteny Practical Medical Microbiology. 14th edition. New York: Elsevier science
- Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: Principles of clinical chemistry

Course code: CLN235

Credit hours: 3(2+1)

Intended semester: (3)

Course duration: 15 weeks

Course description:

This course covers the patholophysiology and diagnosis of carbohydrates and lipids disorders.

Course objectives:

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

1. Describe the classification, digestion, absorption & metabolism of carbohydrates and lipids, and understand the disorders of glucose and lipids metabolism.
2. Describe the digestion & absorption of carbohydrates, and explain the various means by which glucose may be metabolized.
3. Discuss pathophysiology of carbohydrate disorders.
4. Identify the basis of metabolism and laboratory finding and methods for blood sugar estimation.
5. Discuss the metabolism of lipids and lipoproteins and types and causes of Hyperlipidemia.
6. Investigate patients with Hyperlipidemia.
7. Define obesity and discuss causes and healthy consequences of obesity.
8. Perform lipids profile with different methods.

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Instruction methods:

- Lectures
- Practical

- Tutorials and seminars
- Assignments

Course contents:

Week (1)	Carbohydrate (Biochemistry & metabolism) • Classification of Carbohydrates • Chemical Properties of Carbohydrates • Glucose Metabolism • Fate of Glucose • Regulation of Carbohydrate Metabolism
Week (2)	Carbohydrates disorders • Genetic Defects in Carbohydrate Metabolism • Hyperglycemia • Diabetes Mellitus • Pathophysiology of Diabetes Mellitus • Criteria for Testing for Prediabetes and Diabetes • Criteria for the Diagnosis of Diabetes Mellitus • Criteria for the Testing and Diagnosis of Gestational Diabetes Mellitus
Week (3)	Diabetes mellitus type I & II • Complications of disease process. • Hypoglycaemia.
Week (4)	Investigations of carbohydrates disorders: • Role of laboratory in differential diagnosis and management of patients with glucose metabolic alterations • Methods of Glucose Measurement • Glucose Tolerance and 2-Hour Postprandial Tests • Glycosylated Hemoglobin/Hemoglobin A1c • Microalbuminuria
Week (5)	Reducing substances: • Definition • Common reducing substances found in urine • Sources of reducing substances • Ketone bodies • Methods of Ketone measurement
Week (6)	Tutorial

Week (7)	Plasma lipids & lipoproteins metabolism • lipid chemistry • general lipoprotein structure • lipoprotein physiology and metabolism • Lipid absorption • Exogenous pathway • Endogenous pathway • Reverse cholesterol transport pathway
Week (8)	Clinical disorders of lipid metabolism: • Primary hyperlipidemia • Secondary hyperlipidemia • Hypercholesterolemia • Hypertriglyceridemia • Atherosclerosis
Week (9)	Plasma lipids & lipoprotein metabolism disorders: • Frederickson's classification of lipid disorders • Hyperlipoproteinemia • Combined Hyperlipoproteinemia • Lipoprotein(a) Elevation • Hypolipoproteinemia • Hypoalphalipoproteinemia
Week (10)	Estimation methods of lipids & lipoproteins: • Cholesterol Measurement • Triglyceride Measurement • Lipoprotein Methods • High-Density Lipoprotein Methods • Low-Density Lipoprotein Methods • Frederickson's equation for calculation of LDL
Week (11)	Seminar
Week (12)	Obesity: • Definition • Classification • causes of obesity • Health consequences of obesity • Strategies to promote health
Week (13)	Hypertension: • Definition • Mechanisms that Regulate BP • Rationale of hypertension • Classification • Health consequences of hypertension

Week (14)	Cases study: • Obesity Cases • Hypertension cases.
Week (15)	Tutorial

Practical:	
Week (1)	Glucose estimation (Chemical method).
Week (2)	Glucose estimation (Enzymatic method).
Week (3)	Glucose tolerance test (1).
Week (4)	Glucose tolerance test (2).
Week (5)	Case study (Glucose).
Week (6)	Detection of reducing substance
Week (7)	Total cholesterol estimation.
Week (8)	Triglyceride estimation
Week (9)	HDL estimation.
Week (10)	LDL estimation (Direct & calculated method).
Week (11)	Case study: Hyper lipidaemia .
Week (12)	Case study: obesity
Week (13)	Case study: hypertension
Week (14)	Case study: patients with DM, HTN, and hyper lipidemia
Week (15)	Tutorial.

References:

- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.
- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Laboratory Instrumentation

Course code: INS236

Credit hours: 3(2+1)

Intended semester: (3)

Course duration: 15 weeks

Course description:

This course covers the fundamental principles, component, and operation, and applications of laboratory instruments.

Course Objectives:

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

1- Identify of the basic concepts of laboratory equipment.
2- Recognize the principles of basic laboratory instruments
3- Recognize the principles of basic laboratory instruments
4- Identify the components of laboratory instruments
5- Identify the components of laboratory instruments
6- Explain standard use of laboratory equipment.
7- Operate basic laboratory instruments.

Instruction methods:

- Lectures
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 80%
- Activities: 20%

Course contents:

Week (1)	Introduction to Laboratory instrument. • Definition. • Explain standard laboratory equipments used in laboratory •

Week (2)	The basic principles of instrument: • Physical principle • Chemical principle
Week (3)	Optical microscope: • light o Definition light. o Types of Light. o Behaviors of light. o Color Mixing • Microscope: o Definition. o Types of microscope o Know the components necessary for building optical instruments. o Standard operation principle. o Routine check
Week (4)	Tutorial
Week (5)	Colorimeter: • Definition. • Know the components necessary for building optical instruments. • Standard operation principle. • Explain the differences between filters and monochromators. • Standard operation procedure.
Week (6)	Flame photometer: • Definition. • Know the components necessary for building optical instruments. • Standard operation principle. • Explain the differences between filters and monochromators.

	• Standard operation procedure.
Week (7)	Equipments uses water • Water: o Definition water. o Type of heat transference systems: • Water bath: o Definition. o Know the components. o Standard operation principle. o Standard operation procedure.
Week (8)	Sterility: autoclave and oven: • Sterilization o Definition. o Type of Sterilization
Week (9)	Autoclave and oven: • Definition. • Know the components. • Standard operation principle. • Standard operation procedure.
Week (10)	Tutorial
Week (11)	Incubator: ▪ Definition. ▪ Know the components. ▪ Standard operation principle. ▪ Standard operation procedure.

Week (12)	Distilled water: ▪ Definition. ▪ Know the components. ▪ Standard operation principle. ▪ Standard operation procedure.
Week (13)	Equipments used motor: • Motor: o Definition. o Type of motor • Centrifuge: o Definition. o Know the components. o Standard operation principle. o Standard operation procedure.
Week (14)	Mixers and rotators: ▪ Definition. ▪ Type of mixers and rotators. ▪ Know the components. ▪ Standard operation principle. ▪ Standard operation procedure.
Week (15)	Tutorial

References:

- Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
- Bell S., Morris K. (2010). An introduction to microscopy. 1st edition. Tylor & Francis group.
- Sood R. (2015). Concise book of medical laboratory technology: methods and interpretations. 2nd edition. London: The health sciences publisher.
- Suvarna K., Layton C., Bancrofti J.D. (2012). Bancrofti's Theory and practice of histological techniques. 7th edition. London: Churchill Livingstone.

Course title: Nematodes

Course code: PRA237

Credit hours: 3(2+1)

Intended semester: (3)

Course duration: 15 weeks

Course description:
This course provides comprehensive information about Nematode worms including classification, morphology, pathogenicity, laboratory diagnosis, control, and treatment.

Course objectives and learning outcomes:

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

Instructional methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Nematodes: • Introduction • Classification
Week (2)	Ascaris lumbricoides: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control

Week (3)	Trichuris trichura: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (4)	Entrobius vermicularis: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (5)	Hook worms: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (6)	Strongyloides stercoralis: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (7)	Larva migrans; • Definition • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis
Week (8)	Examination of blood for Helminthes
Week (9)	Wucheraria bancrofti • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control

Week (10)	Loa Loa, Mansonella spp • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (11)	Brugiamalayi, Brugiatimori: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (12)	Onchocerca volvulus: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (13)	Draconculusmedinensis: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (14)	Trichenellaspiralis: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (15)	Tutorial

Practical	
Week (1)	General Morphology of Nematodes
Week (2)	Ascaris Lumbricoides (all stages)
Week (3)	Trichuris trichura (all stages)
Week (4)	Entrobius vermicularis (all stages)
Week (5)	Hook worm (all stages)
Week (6)	Storngyloides stercoralis (all stages)
Week (7)	Laboratory diagnosis of larva migrant
Week (8)	Blood concentration techniques
Week (9)	Wucheraia bancrofti (all stages)
Week (10)	Lao loa (all stages)
Week (11)	Brugia spp
Week (12)	Onchocerca volvulus all (Skin snip, biopsy, and tissue processing for tissue worms)
Week (13)	Draconculus medinensis
Week (14)	Trichenella spiralis (all stages)
Week (15)	Tutorial

References:

- Arora D.R., Arora B.B. (2014). Medical parasitology. 4th edition. New Delhi: CBS publishers & distributors.
- Day N.C., Dey T.K., Dey S.M. (2010). Medical parasitology. 11th edition. London: New central book agency (P) Ltd.
- John D.T., Petrr W.A. (2006). Markell and Voge's medical parasitology. 9th edition. Philadelphia: Elsevier.

SEMESTER FOUR

Course title: Basic haematological techniques

Course code: HEM241

Credit hours: 3(2+1)

Intended semester: (4)

Course duration: 15 weeks

Course description:
This course provides the student with the basics of haematological techniques. It covers collection, handling, and transport of haematological samples, routine haematological methods, and principle of automated haematology analyzers.

Course o**bjectives:**

1. Perform the collection, handling, storage and transport of the blood samples.
2. Perform the haemoglobin estimation by different methods and protocols.
3. Define haemocytometry and describe their purposes, principle, diluents and method.
4. Discuss the principle of/ and perform haematocrit.
5. Perform total white blood cell count and differential count.
6. Identify the different types of Romanowsky stains.
7. Prepare, stain and examine thin blood film and comment on peripheral blood picture.
8. Discuss the principle of automated hematology analyzers , identify causes of trouble shooting and problem solving.
9. Discuss the principle/ and Perform erythrocyte sedimentation rate by different methods.
10. Describe source of errors in different routine haematological techniques
11. Define quality assurance and describe quality assurance stages for routine haematological investigations.

Instructional methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theoretical examination:40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Orientation

Week (2)	Safety in haematology laboratory: • Types of hazards in haematology laboratory • Universal precausions • Waste disposal
Week (3)	Blood sample collection, handling, storage and transport: • Finger prick • Venipuncture • Anticoagulants • Handling, storage and transport of blood samples • Sourse of errors
Week (4)	Haemoglobin estimation: • Haemoglobin estimation methods • Haemoglobin curve • Haemoglobin chart
Week (5)	Introduction to haemocytometry: • Definition • purpose • Principles • Source of errors
Week (6)	Red blood cell count: • Aim • Principle • Diluent • Method • Calculation • Reference values • Source of errors
Week (7)	Haematocrit (packed cell volume) and red blood cell indices: • Haematocrit o Definition o Principle o Method o Reference values o Source Definitions • Red cell indices: o Definition o Uses o Calculations o Applications o Reference values

Week (8)	Preparation of blood film and Romanowsky stains:
	• Paratnition of thin blood film:
	  ○ Spreading
	  ○ Fixation
	  ○ Staining
	• Romanwsky stains:
	  ○ Definition
	  ○ Types
	  ○ Composition
	  ○ Preparation
	  ○ Principles of staining
	  ○ Uses in haematology

Week (9)	WBC counts:
	• Total WBC count
	  ○ Aim
	  ○ Principle
	  ○ Diluent
	  ○ Method
	  ○ Calculation
	  ○ Reference values
	  ○ Source of errors
	• Differential WBC count
	  ○ Aim
	  ○ Method
	  ○ Source of errors
	• Calculation of absolute values

Week (10)	Platelet count • Aim • Principle • Diluent • Method • Calculation • Reference values • Source of errors
Week (11)	Variations in blood cell morphology: • Comment on peripheral blood picture (PBP) • Abnormal red blood cell morphology • Morphological abnormalities of leucocytes • Morphological abnormalities of platelets
Week (12)	Complete blood count: • Tests • Results interpretation • Clinical significance

Week (13)	Automated haematology analyzer (cell counter): • Advances • Principles • Troubleshooting • Problem resolving
Week (14)	Artificial abnormalities of complete blood count: • Effect of anticoagulants • Effect of sample storage • Abnormalities due bad techniques
Week (15)	Erythrocyte sedimentation rate (ESR): • Purpose • Principle • Methods • Reference values • Source of errors

Practical:	
Week (1)	Introduction
Week (2)	Blood sample collection
Week (3)	Blood sample collection
Week (4)	Hb estimation
Week (5)	Construction of Hb curve and chart
Week (6)	Introduction to haemocytometry
Week (7)	Total WBC count
Week (8)	Platelet count
Week (9)	RBC count
Week (10)	Haematocrit
Week (11)	Calculation of RBC indices
Week (12)	Differential WBC count and calculation of absolute values
Week (13)	Complete blood count- CBC (manual methods)
Week (14)	Complete blood count- CBC (automation)
Week (15)	Erythrocyte sedimentation rate (ESR)**.**

References:

- Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
- Hoffbrand A.V., Moss P.H.A., Pettit J.E. (2006). Essential Haematology. 5th edition. Massachusetts: Blackwell publishing Ltd.
- Steine-Martin E.A., Lotspeich-Steininger C.A., Koepke J.A. (1998). Clinical Haematology: principles, procedures, correlation. 2nd edition. Philadelphia: Lippincott-Raven publishers.

Course title: Basic microbiological techniques

Course code: MCR242

Credit hours: 3(2+1)

Intended semester: (4)

Course duration: 15 weeks

Course description:
This course provides the student with the information and skills necessary to perform different staining reactions, types and preparation of culture media, biochemical reactions, identification of gram positive cocci and antimicrobial sensitivity.

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

1. Identify principles of different basic bacteriological techniques
2. Perform Gram stain, ZN stain and special bacteriological stains.
3. Prepare, inoculate and incubate culture media and biochemical test.
4. Perform the laboratory methods used for the isolation, identification, of gram positive cocci.
5. Recognize the modes of action of antimicrobial drugs and the procedures of sensitivity testing.

Instructional methods:

- Lectures
- Laboratory practical
- Tutorials and seminars
- Assignments

Evaluation:.

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Staining: Theory, types, making and fixing smears and simple stain.
Week (2)	Gram stain, ZN stain and fluorescent techniques: Theory, principle, and application.
Week (3)	Spore stain, capsules, Dark field microscopy: Theory, principle, types and application.

Week (4)	Culture media: Definition, uses, common ingredients and classification
Week (5)	Culture media: Selection, preparation and storage
Week (6)	Inoculation and incubation: Methods, apparatus used types and applications).
Week (7)	Biochemical tests for Gram negative rod: Uses, classification, citrate, indole, urease and oxidase.
Week (8)	Biochemical tests for Gram negative rods: KIA, SFT, Motility, OF & VP-MR.
Week (9)	Staphylococci (*S. aureus):* General properties, pathogenecity, antigenic composition and genes.
Week (10)	Coagulase negative staphylococci and laborstory diagnosis of staphylococci
Week (11)	Beta-haemolytic streptococci: General properties, pathogenecity, antigenic composition, genes and lab diagnosis.
Week (12)	Alpha-haemolytic streptococci: General properties, pathogenecity, antigenic composition, genes and lab diagnosis.
Week (13)	Non-haemolytic streptococci: General properties, pathogenecity, antigenic composition, genes and lab diagnosis.
Week (14)	Antimicrobial drugs: Mode of actions, classification types and bacterial resistance.
Week (15)	Sensitivity testing: Dilution technique, diffusion technique and E-test

Practical:	
Week(1)	Making and fixing smears and simple stain.
Week(2)	Gram stain.
Week(3)	ZN stain.
Week(4)	Spore stain
Week(5)	capsule stain.
Week(6)	Preparation of basic and differential culture media.
Week(7)	Preparation of selective culture media.
Week(8)	Preparation of enriched media, inoculation and incubation.
Week(9)	Biochemical tests for gram negative bacteria(citrate, indole, urease & oxidase).
Week(10)	Biochemical tests for gram negative bacteria (KIA, SFT, motility, OF, and VP-MR)
Week(11)	Staphylococci.

Week(12)	Beta-haemolytic streptococci.
Week(13)	Alpha-haemolytic streptococci.
Week(14)	Non-haemolytic streptococci.
Week(15)	Sensitivity testing.

References:

1. Cheesbrough, M. Distinct Laboratory Manual IN tropical countries. (2008). Revised 2nd edition. Cambridge: Cambridge University press.
2. Collee J. G., Marmion B. P., Fraser A. G.; Simmons A. (2007). Mackie and McCarteny Practical Medical Microbiology. 14th edition. New York: Elsevier science
3. Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: Basic molecular biology

Course code: MLB243

Credit hours: 2(2+0)

Intended semester: (4)

Course duration: 15 weeks

Course description:
This course provides the students with basic information about nucleic acids structure and fuctions, gene expression, and mutations. It also covers the principles and applications of molecular biology techniques used in medical laboratories.

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

1. Identify the bases, concepts and terminologies of molecular biology
2. Recognize molecular structures of eukaryotic and prokaryotic cell.
3. Differentiate between various types of nucleic acids
4. Discuss different steps of DNA replication and gene expression
5. Discuss different types of mutation.
6. Recognize restriction enzymes and their uses
7. Apply the different methods of nucleic acid extraction
8. Apply different steps of PCR and electrophoresis

Instruction methods:

- Lectures
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 80%
- Activities: 20%

Course contents:

Week (1)	Introduction to molecular biology: • Definitions of molecular biology and terminology. • Historical overview of molecular biology milestone events • Role in medicine.

Week (2)	Nucleus, chromatin and chromosome: • Structure • Differences • Functions • Their organization at different developmental stages
Week (3)	Nucleic acids – Types and Structure . • Historical overview • DNA & RNA structure • Topology • Differences
Week (4)	DNA Replication • Why • When • How • Different proteins involved • Detailed mechanism
Week (5)	RNA - Types and function • RNA world • Why RNA is needed • Structure of different types • Peculiarities of different RNAs
Week (6)	Gene expression • The concepts of Gene, Genome, Transcriptome and proteome • Central dogma of molecular biology • Different steps of gene expression • Transcription steps and requirements
Week (7)	RNA processing and Gene code • mRNA modification • Capping and Tailing • Splicing and alternative splicing • The concept of codon • The genetic code and its properties .
Week (8)	Translation • Why • When • How • Different elements involved • Detailed mechanism
Week (9)	Mutation • Mutation and polymorphism. • Different types of mutation. • Point mutation • Chromosomal mutation, structural and numerical • Medical implications

Week (10)	Restriction enzymes • Exonucleases and endonucleases • Their source and function • Nomenclature • Different types • Uses • Different type of cuts
Week (11)	Nucleic acids extraction • DNA extraction • RNA extraction • cDNA
Week (12)	Electrophoresis and blotting • Definition • Principles • The uses • Different types • Different components • Steps • Different types of blotting • Differences between southern, northern and western
Week (13)	RFLP and gene cloning • RFLP concept and uses • Gene cloning and libraries
Week (14)	Polymerase chain reaction • The principle • Different components • Set up a PCR • The primers • Steps
Week (15)	Tutorial

References:

- Champe P.C., Harvey R.A., Ferrier D.R. (2005). Biochemistry. 3rd edition. USA: Lippincott Williams & Wilkins.
- Craig N.L., Cohen-Fix O., Green R. Greider C.W., Storz G. Wolberger C. (2010). Molecular biology: principles of genome function. Oxford: Oxford University press.
- Elliot W.H, Elliot D.C. (2006). Biochemistry and molecular biology. 3rd edition. New York: Oxford University press.

Course title: Cestodes and Trematodes

Course code: PRA244

Credit hours: 3(2+1)

Intended semester: (4)

Course duration: 15 weeks

Course description:

This course provides information about platyhelminthes classification, morphology, pathogenicity, laboratory diagnosis, control, and treatment.

Course o**bjectives:**

1. Demonstrate adequate knowledge about the biology, pathology and epidemiology of medically important worms.
2. Discuss the principle and practice techniques which are used in the diagnosis of parasitic worms.
3. Identify the taxonomy and morphology of hilmenth .
4. Numerate the factors affecting nutrition, growth, and methods of reproduction and multiplication of platyhelminthes of medical importance.
5. Discuss the biology and pathogenicity of platyhelminthes of medical importance.
6. Recognize the features and spread of platyhelminthes.
7. Perform the laboratory techniques used for platyhelminthes diagnosis.

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Instructional methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Course contents:

Week (1)	Platyhelminthes: • Classification • Biology
Week (2)	Cestodes: • Biology • Anatomy
Week (3)	T. saginata, & Taenia solium: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (4)	Hymenolepis nana, Hymenolepis diminuta, Dipylidium caninum • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (5)	Echinococcus granulosus, Echinococcus multilocularis: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (6)	Diphyllobothrium latum,S. prognosis, and other tapeworms: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (7)	Trematodes:

	• Biology • Anatomy
Week (8)	Fasciola hepatica Fasciola gigantica,Fasciolopsisbuski: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (9)	Heterophyesheterophyes,Clonorchissinensis, Paragonimus spp.: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (10)	Blood flukes Schistosoma species: • Taxonomy • Lifecycle
Week (11)	Schistosomamansoni, S. intercalatum: • Pathology • Laboratory diagnosis
Week (12)	Schistosomahaematobium,S.bovis: • Pathology • Laboratory diagnosis
Week (13)	Schistosomajaponicum, S. mekongi: • Pathology • Laboratory diagnosis
Week (14)	Control of schistosomiasis
Week (15)	Tutorial

Practical:

Week (1)	Platyhelminthes (Classification & biology)
Week (2)	Cestodes (Biology, anatomy)
Week (3)	T. saginata, Taeniasolium
Week (4)	Hymenolepis nana, Hymenolepis diminuta, & Dipylidium caninum
Week (5)	Echinococcus granulosus , & Echinococcus multilocularis
Week (6)	Diphyllobothriumlatum,Spragnosis. & Other tapeworms
Week (7)	Trematodes (Biology, Anatomy)
Week (8)	Fasciola hepatica Fasciol agigantica, & Fasciolopsisbuski
Week (9)	Heterophyesheterophyes,Clonorchissinensis, & Paragonimus spp.
Week(10)	Blood flukes: Schistosoma species
Week(11)	Schistosoma mansoni, & S. intercalatum
Week(12)	Schistosoma haematobium, & S.bovis
Week(13)	Schistosoma japonicum, & S. mekongi
Week(14)	Control of Schistosomiasis
Week(15)	Tutorial

References:

- Arora D.R., Arora B.B. (2014). Medical parasitology. 4th edition. New Delhi: CBS publishers & distributors.
- Day N.C., Dey T.K., Dey S.M. (2010). Medical parasitology. 11th edition. London: New central book agency (P) Ltd.
- John D.T., Petrr W.A. (2006). Markell and Voge's medical parasitology. 9th edition. Philadelphia: Elsevier.

Course title: Clinical immunology

Course code: IMN245

Credit hours: 3(2+1)

Intended semester:(4)

Course duration: 15 weeks

Course description:

This course covers the immuno tolerance and the immunological responses against pathogenic organisms. It also provides the students with information about mechanisms, classification, and diagnosis of immunological diseases.

Course objectives:

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

1. Define and classify immunological diseases.
2. Discuss immunological mechanisms that underline immunological diseases
3. Apply the immunological techniques
4. Define the tolerance of immunity, immune suppression, immune deficiency, and auto immunity
5. Recognize the immunological mechanisms against viral, bacterial, fungal, protozoan, and worm infections
6. Discuss classification, mechanisms, and laboratory diagnosis of all types hypersensitivity
7. Identify the principles of vaccination and vaccine production in addition to immunity to cancer

Instructional methods

- Lectures
- Laboratory Practical
- Tutorials and seminars
- Assignments

Evaluations

Theory examination: 40%
Practical examination: 40%
Activities: 20%

Course contents:

Week (1)	Tolerance and immune suppression ▪ Tolerance ▪ Immune suppression

Week (2)	Auto immunity and autoimmune diseases ▪ Auto immunity ▪ Auto –immune disease
Week (3)	Infection and immunity (1) ▪ Immunity to viruses
Week (4)	Infection and immunity (2) ▪ Immunity to bacteria ▪ Immunity to fugi
Week (5)	Infection and immunity (3) ▪ Immunity to protozoa ▪ Immunity to helminthes
Week (6)	Primary immune deficiency ▪ Humoral & CMI deficiency ▪ Severe combined immune deficiency syndrome
Week (7)	Secondary immune deficiency ▪ AID & HIV infection ▪ Immune response to HIV
Week (8)	Hypersensitivity (1) ▪ Classification of hypersensitivity ▪ Allergy and mechanisms
Week (9)	Hypersensitivity (2) ▪ Hypersenitivty types II ▪ Hyper sensitivity type III
Week (10)	Hypersensitivity (3) ▪ Hypersensitivity types IV ▪ Hypersensitivity type V & VI
Week (11)	Tissue transplantation ▪ Effectors that mediate transplant rejection ▪ Current clinical status of transplantation
Week (12)	Tissue typing ▪ Principles ▪ Techniques
Week (13)	Immunity to Cancer ▪ Cancer biology

	▪ Immunology of Cancer prevention, immunodiagnosis and immune therapy
Week (14)	Vaccination ▪ Vaccine design ▪ Adjuvant
Week (15)	Immunology techniques ▪ Important techniques for immune essay and immune diagnosis ▪ Available techniques

Practical:	
Week (1)	Orientation
Week (2)	Anatomy of the immune system
Week (3)	Agglutination reaction-1
Week (4)	Agglutination reaction-2
Week (5)	Precipitation reaction-1
Week (6)	Precipitation reaction-2
Week (7)	Precipitation reaction-3
Week (8)	Immuno chromogenic test (ICT)
Week (9)	Radio immuno assay (RIA)
Week (10)	Preparation of antisera
Week (11)	Complement fixation test-1
Week (12)	Complement fixation test-2
Week (13)	Enzyme linked immuno assay (ELISA)-1
Week (14)	Enzyme linked immuno assay (ELISA)-2
Week (15)	Tutorial

References:

- Abbas A.K., Lichtman A.H. (2006-2007). Basic immunology: functions and disorders of the immune system. updated edition. Philadelphia: Elsevier

- Mohanty S.K., Leela K.S. (2014). Textbook of immunology. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Rich R.R. (2001). Clinical immunology. 2nd edition. London: Mosby international Ltd.
- Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: General Pathology

Course code: HST246

Credit hours: 3(2+1)

Intended semester: (4)

Course duration: 15 weeks

Course description:
This course will provide the students with the general concepts of Pathophysiology. It will introduce the concepts of injury and departures from normal structure and function in the human body, as occurs in disease. The various pathological processes and their importance in the basis of human disease will also be studied. In addition, correlation with clinical presentation will also be made, with particular reference to cardiovascular, respiratory and gastrointestinal disorders.

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

1- Discuss the process that lead to pathology disturbances.
2- Recognize the macroscopic and microscopic changes in tissue of some pathological disorders.
3- Develop a positive attitude towards pathology and to work as a member of team with other health personnel.
4- Explain the terms of etiology and pathogenesis.
5- Describe the morphology and function of cell undergoing reversible and irreversible cell damage.
6- Describe the macro-and microscopic changes in acute and chronic inflammation and sequel of inflammation.
7- Describe the cells involved in acute and chronic inflammation and their function.
8- Describe about healing and repair process.
9- Describe the mechanism of thrombosis, embolism, edema, hyperemia, hemorrhage, ischemia and Infarction
10- Discuss pathogenesis and morphology of some immune-pathological disorders.
11- Describe etiology, pathogenesis and morphology of some infectious tropical diseases, and describe circulatory disturbances in the body.
12- Describe etiology of tumor, differences between benign and malignant cells,and mechanism of carcinogenesis.

Instruction methods:

- Lecture
- Practical
- Seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to pathology
Week (2)	Causes and mechanisms of cell injury.
Week (3)	Reversible injury and cell death
Week (4)	Cellular adaptation mechanisms
Week (5)	Acute inflammation-I
Week (6)	Acute inflammation-II.
Week (7)	Chronic inflammation and Granuloma.
Week (8)	Healing and repair
Week (9)	Intracellular accumulations and pigmentation.
Week (10)	Edema, hyperemia, and hemorrhage.
Week (11)	Thrombosis.
Week (12)	Embolism, ischemia, and infarction
Week (13)	Tropical diseases
Week (14)	Neoplasia-I: definition, classification, nomenclature, and cell biology of tumors
Week (15)	Neoplasia-II: Tumor etiology, and carcinogenesis
Practical:	
Week (1)	Introduction to pathology and microscopic examination of different types of tissue necrosis
Week (2)	Microscopic examination and gross pathological specimens of different types of tissue healing and keloid.
Week (3)	Microscopic examination and gross pathological specimens of different types of - Bacterial infection - Fungal infection –

Week (4)	Microscopic examination and gross pathological specimens of different types of parasitic infection and viral infection
Week (5)	Microscopic examination and gross pathological specimens of different types of intracellular accumlations and pigmentation
Week (6)	Microscopic examination and gross pathological specimens of different types of ischemia, congestion, gangrene, and edema.
Week (7)	Tutorial
Week (8)	Microscopic examination and gross pathological specimens of different types of acute inflammation
Week (9)	Microscopic examination and gross pathological specimens of different types of chronic inflammatory diseases and Granulation tissues
Week (10)	Microscopic examination and gross pathological specimens of different types of hypersensitivity reactions and auto-immune diseases
Week (11)	Microscopic examination of different types of genetic disorders
Week (12)	Microscopic examination and gross pathological specimens of different types of growth disorders
Week (13)	Microscopic examination and gross pathological specimens of different types of Neoplasia (Lipoma, Fibroma, carcinomas, and sarcomas)
Week (14)	Microscopic examination and gross pathological specimens of different types of malignant tumors
Week (15)	Tutorial

References:

- Garg R.G., Gupta S. (2011). Review of pathology and genetics. 3rd edition. New Delh: Jypee brothers medical publisher (P) Ltd.
- Kierszenbaum A.L. (2007). Histology and cell biology: an introduction to pathology. 2nd edition. Philadelphia: Elsevier limited.
- Mohan H. (2007). Pathology practical book.2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.

Course title: Plasma proteins and electrolytes

Course code: CLN247

Credit hours: 3(2+1)

Intended semester: (4)

Course duration: 15 weeks

Course description:
This course covers the synthesis, functions, and methods of measurement of plasma proteins and its relation to pathological conditions. Also it covers the body water and electrolytes distribution, the methods of electrolytes estimation, and disturbances associated with certain disorders.

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

9. Discuss the synthesis, general functions, metabolism and laboratory measurement of plasma proteins &it's related disorders.
10. Discuss the principle of Turbidimetry and Refractometery.
11. Describe the fundamentals of body water, electrolyte distribution (Na^+ and K^+) and their regulation mechanism.
12. Define and describe acid base balance.
13. Perform investigations of disorders of acid-base balance.
14. Recognize the metabolism, disorder and method for calcium, phosphorous and magnesium estimation.
15. Perform the laboratory methods applied for calcium, phosphorous and magnesium estimation.

Instructional methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Plasma protein • Classification • Function • Specific plasma protein
Week (2)	Plasma protein (Disorder) • Hyper & Hypoproteinaemia • Hyper & Hypoalbuminaemia • Hyper & Hypoglobulinaemia
Week (3)	Turbidimetry & Refractometery • Principle • Procedure
Week (4)	Distribution of body water and electrolytes**:** • Body Water Content • Fluid Compartments • Extracellular and Intracellular Fluids • Transport of Water and Fluids
Week (5)	Water Balance and ECF Osmolality • Mechanisms of Fluid Gain and Loss • Disorders of Water Balance
Week (6)	Control of body water and electrolytes (Na) balance: • Electrolytes (cations and anions) • Electrolyte Functions • Sodium • Regulation of Sodium • Clinical features of hypo & hypernatremia.
Week (7)	Control of body water and electrolytes (K) balance: • Potassium • Potassium regulation • Clinical features of hypo & hyperkalemia. • Bicarbonate ion (HCO_3^-) • Chloride (Cl^-)
Week (8)	Acid base balance. Mechanism of regulation**:** • Blood pH • Sources of hydrogen ions • Hydrogen ion regulation • Chemical buffer systems • Physiological buffer systems
Week (9)	Acid base disorders**:** • Blood Gas Analyzers: pH, pCO2, and pO2 • Respiratory acidosis and alkalosis
Week (10)	Acid base disorders**:** • Metabolic Acidosis and Alkalosis

Week (11)	Bone mineral- metabolism**:** • Calcium homeostasis • Calcium functions • Calcium regulation
Week (12)	Bone mineral- metabolism Phosphate regulation • Magnesium • Magnesium functions and regulation
Week (13)	Bone mineral- Disorder. • Disorders of Calcium homeostasis • Disorders of Phosphate homeostasis • Disorders of magnesium homeostasis • Bone Diseases:osteoporosis,Paget's disease,osteomalecia &rickets.
Week (14)	Bone mineral- methods of estimation**:** • Measurement of Calcium • Precautions in calcium measurement • Measurement of magnesium • Measurement of phosphorus
Week (15)	Tutorial

Practical:	
Week (1)	Orientation
Week (2)	Total protein & albumin estimation & calculation of globulin concentration
Week (3)	Total protein estimation (Comparison refractometery& chemical)
Week (4)	Case study: Water distribution and electrolytes.
Week (5)	Case study: hyponatremia
Week (6)	Flame photometer (components& Operation)
Week (7)	Flame photometer (preparation of STD) and measurement of Na.
Week (8)	Flame photometer (preparation of STD) and measurement of K.
Week (9)	Estimation of calcium.
Week (10)	Estimation of phosphorus.
Week (11)	Estimation of calcium (Case study).
Week (12)	Estimation of phosphorus (Case study).
Week (13)	Estimation of magnesium (Case study).
Week (14)	Quality control (Chart plotting)
Week (15)	Tutorial

References:

- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.

- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Tissue staining techniques I

Course code: HST248

Credit hours: 3(2+1)

Intended semester: (5)

Course duration: 15 weeks

Course description:

This course covers the uses, principles and methodologies of special histopathological techniques used for demonstration of proteins, nucleic acids, carbohydrates, Amyloid and lipids. In addition, provides an introduction to cytological investigations.

Course Objectives:

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

1- Define the general aspects and the general principles of the analytical phase for histopathology laboratory methods
2- Perform the initial processes intended to ensure the quality of the histopathological techniques
3- Deal with, and select special procedures applied to differential diagnosis (special stains)
4- Recognize applications, uses and quality control of different special staining procedures used to demonstrate specific materials and structures in histological sections.
5- Perform all the histochemical methods used for demonstration of the nucleic acids
6- Classify carbohydrates and identify the normal and abnormal location of most important carbohydrates (glycogen and mucin) with the different histochemical techniques used for demonstration of these two substances.
7- Describe amyloid and amyloidosis and discuss classification of amyloidosis, and methods of demonstration.
8- Classify lipids, and identify pathological applications and the different methods used for demonstration of lipids in tissue sections
9- Define the cytology and cytopathology, and perform procedures concern with collection, fixation, and staining of cytological smears.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%,
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	**Introduction to special stains**
Week (2)	**Demonstration of proteins:** • Enzymehistochemical methods • Immunohistochemical methods
Week (3)	**Demonstration of nucleic acids:** • Feulgen reaction • Methyl green-pyronin • Gallocyanin chrome- Fluorescent methods)
Week (4)	**Glycogen:** • Normal location • Pathological conditions • Fixation
Week (5)	**Demonstration of Glycogen:** • Periodic acid Schiff's (PAS) • Hexamine silver technique for glycogen
Week (6)	**Mucins:** • Classification • Normal location • Pathological applications
Week (7)	**Demonstration of mucins:** • Alcian blue • Dialyzed iron Prussian blue • Combined alcian blue- PAS
Week (8)	**Tutorial**
Week (9)	**Amyloid:** • Definition, composition and classification, • Demonstration of amyloid (Congo red techniques, metachromasia, fluorescent methods and immunocytochemistry)
Week (10)	**Tutorial**

Week (11)	**Lipids:** • Definition • Composition • Classification
Week (12)	**Demonstration of lipids:** • Preparation of tissue for lipids demonstration • Histophysical and histochemical methods • Applications in pathology
Week (13)	**Introduction to cytology-I:** • Introduction • Application • Sample collection (cervical and endometrial samples)
Week (14)	**Introduction to cytology-II:** • Cytological fixatives • Routine staining in cytology
Week (15)	**Tutorial**

Practical:	
Week (1)	Alum Haematoxylin and Eosin.(progressive stain)
Week (2)	Alum Haematoxylin and eosin (regressive stain)
Week (3)	Feulgen reaction at room temperature
Week (4)	Periodic Schiff's reaction (PAS) for glycogen
Week (5)	Hexamine silver technique for glycogen
Week (6)	Alcian blue for acid mucins
Week (7)	Dialyzed iron Prussian blue for acid mucin
Week (8)	Combined alcian blue- PAS for acid and neural mucin
Week (9)	Tutorial
Week (10)	Highman`s Congo red for amyloid
Week (11)	Crystal violet for amyloid
Week (12)	Orientation of cytological methods: collection of samples.
Week (13)	Haematoxylin and Eosin for cytological smear.

Week (14)	Papanicolaou stain for buccal smear
Week (15)	Tutorial

References:

- Prasad S.R. (2011). Practical histology for medical students. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Suvarna K., Layton C., Bancrofti J.D. (2012). Bancrofti's Theory and practice of histological techniques. 7th edition. London: Churchill Livingstone.
- Young B. Stewart W., O'Dowd G. (2009). Wheather's basic pathology: a text, atlas, and review of histopathology. 5th edition. London: Chuchill Lvingstone.

SEMESTER FIVE

Course title: Blood cells disorders

Course code: HEM351

Credit hours: 3(2+1)

Intended semester: (5)

Course duration: 15 weeks

Course description:

This course covers the definition, causes, pathophysiology, clinical features, and laboratory diagnosis of red and white blood cells disorders.

Course objectives:

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

1. Define anaemia and leukaemia
2. Describe classification of anaemia and leukaemia
3. Describe the causes, pathophysiology, clinical feature and laboratory diagnosis of anaemia and leukaemia
4. Discuss the principle of/ and perform laboratory investigations used for diagnosis of anaemia and leukaemia

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Course contents:

Week (1)	Introduction to anaemia: • Definition • Classification • Body adaptation • Clinical features • Laboratory diagnosis

Week (2)	Iron metabolism and iron deficiency anaemia:
	• Iron metabolism
	• Iron deficiency anaemia
	  ○ Definition
	  ○ Causes
	  ○ Pathopgysiology
	  ○ Clinical features
	  ○ Laboratory diagnosis
	  ○ Treatment

Week (3)	Megaloblastic anaemia: • Definition • Causes • Pathopgysiology • Clinical features • Laboratory diagnosis • Treatment
Week (4)	Aplastic anaemia: • Definition • Causes • Pathopgysiology • Clinical features • Laboratory diagnosis • Treatment
Week (5)	Sideroblastic anaemia: • Types of sideroblasts

	• Definition of sideroblastic anaemia • classification • Causes • Pathopgysiology • Clinical features • Laboratory diagnosis • Treatment
Week (6)	Haemolytic anaemia: • Definition • Classification • Evidence of haemlysis • Clinical features • Laboratory diagnosis
Week (7)	Hereditary spherocytosis: • Definition • Inheritance • Pathopgysiology • Clinical features • Laboratory diagnosis • Treatment
Week (8)	Glucose-6-phosphate dehydrogenase deficiency anaemia: • Definition • Inheritance • Pathopgysiology • Clinical features • Laboratory diagnosis • Treatment
Week (9)	Sickle cell anaemia: • Haemoglobinopathies definition and classification • Definition of sickle cell anaemia • Inheritance

	• Pathopgysiology • Clinical features • Laboratory diagnosis • Treatment
Week (10)	Thalassemia: • Definition • Classification • Inheritance • Pathopgysiology • Clinical features • Laboratory diagnosis • Treatment
Week (11)	Introduction to leukaemia: • Definition • Causes • Classification • Laboratory diagnosis
Week (12)	Acute myeloblastic leukaemia: • Definition • Incidence • FAB and WHO classification • Clinical features • Laboratory diagnosis
Week (13)	Acute lymphoblastic leukaemia • Definition • Incidence • FAB, WHO and immunological classification • Clinical features • Laboratory diagnosis
Week (14)	Chronic myelocytic leukaemia • Definition

	• Incidence • Genetics • Clinical course • Clinical features • Laboratory diagnosis
Week (15)	Chronic lymphocytic leukaemia: • Definition • Incidence • Pathophysiology • Clinical features • Laboratory diagnosis
Practical:	
Week (1)	Complete blood count: normal sampl
Week (2)	Complete blood count: microcytic hypochromic anaemia
Week (3)	Iron profile (serum iron and serum ferritin)
Week (4)	Iron profile (TIBC &TS%)
Week (5)	Bone marrow iron stain
Week (6)	Complete blood count: megaloblastic anaemia
Week (7)	Reticulocyte count
Week (8)	Osmotic fragility test
Week (9)	Sickling test and Hb-S solubility test
Week (10)	Hb-F estimation
Week (11)	Methemoglobin reduction test
Week (12)	Morphology of acute leukaemia
Week (13)	Cytochemical stains
Week (14)	Morphology of chronic myeloid leukaemia
Week (15)	Morphology of chronic lymphoid leukaemia

References:

1. Bain B.J. (2003). Leukaemia diagnosis. 3rd edition. Massachusetts: Blackwell publishing Ltd

2. Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
3. Hoffbrand A.V., Moss P.H.A., Pettit J.E. (2006). Essential Haematology. 5th edition. Massachusetts: Blackwell publishing Ltd.
1. Steine-Martin E.A., Lotspeich-Steininger C.A., Koepke J.A. (1998). Clinical Haematology: principles, procedures, correlation. 2nd edition. Philadelphia: Lippincott-Raven publishers.

Course title: Intestinal and Urogenital Protozology

Course code: PRA352

Credit hours: 3(2+1)

Intended semester: (5)

Course duration: 15 weeks

Course description:

This course provides the students with intensive information about intestinal and urogenital protozoa, in term of classification, morphology, pathogenicity, laboratory diagnosis, control and treatment.

Course o**bjectives:**

1. Demonstrate adequate knowledge about the biology, pathology, and laboratory diagnosis of intestinaland urogenital protozoa of human medical importance.
2. Recognize the relationship between environment and transmission of protozoa.
3. Practice basic laboratory skills that are used in the diagnosis of parasitic infection.
4. Discuss the scope of medical parasitology together with the basic terminology and definitions as well as the nomenclature of protozoa.
5. Discuss biology and taxonomy of protozoa.
6. Practice the basic skills and techniques for stool examination.
7. Identify the main properties of different intestinal and urogenital protozoa.
8. Discuss the biology and epidemiology as well as to practice the basic techniques applied in the diagnosis of intestinal and urogenital protozoa

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to parasitology: • Definition • Components • Terminology
Week (2)	Taxonomy of protozoa
Week (3)	Quality control of stool examination: • Microscopy • Blood sample • Stool sample
Week (4)	Entamoeba histolytica and E. dispar: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (5)	Entamoeba coli and other intestinal amoeba: • Taxonomy • Identefication • Differantiation
Week (6)	Free living amoebae: • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (7)	Giardia lamblia:

	• Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (8)	Other flagellates • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (9)	Isospora belli • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (10)	Cryptosporidium • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (11)	Blantidium coli • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (12)	Tutorial
Week (13)	Opportunistic and nosocomial parasitic infections

Week (14)	Trichomonas vaginalis • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (15)	Tutorial

Practical:	
Week (1)	Orientation (safety, equipments, regulations)
Week (2)	Microscopy
Week (3)	Stool examination
Week (4)	Entamoeba histolytica and allies
Week (5)	Entamoeba coli and other intestinal amoeba
Week (6)	Free living amoebae
Week (7)	Diagnosis of Giardiasis
Week (8)	Other flagellates – trichomonas vaginalis
Week (9)	Tutorial
Week (10)	Coetaneous Leishmaniasis)
Week (11)	Visceral Leishmaniasis)
Week (12)	Seminar: Leishmaniasis in Sudan
Week (13)	African Trypanosomiasis .
Week (14)	American Trypanosomiasis)
Week (15)	Tutorial

References:

- Arora D.R., Arora B.B. (2014). Medical parasitology. 4th edition. New Delhi: CBS publishers & distributors.
- Day N.C., Dey T.K., Dey S.M. (2010). Medical parasitology. 11th edition. London: New central book agency (P) Ltd.
- John D.T., Petrr W.A. (2006). Markell and Voge's medical parasitology. 9th edition. Philadelphia: Elsevier.

Course title: Laboratory Management and quality control

Course code: MNG353

Credit hours: 2(2+0)

Intended semester: (5)

Course duration: 15 Weeks.

Course description:

This course provides the students with the basics of laboratory administration and characters of good and bad manger. It mainly focuses on planning, types of laboratory design, work flow, administration process, safety, and quality measures.

Course objectives:

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

1. Recognize different concepts of laboratory management.
2. Design, mange, plan, organize, and control different clinical laboratories.
3. Perform laboratory tests with relevant and reliable data.
4. Apply measures needed to improve laboratory efficiency and effectiveness.
5. Define quality, quality control, quality assurance and related terms
6. Describe quality assurance stages
7. Perform quality control measures and interpret results

Instructional methods:

- Lectures
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 80%
- Activities

Course contents:

Week 1	The nature of Management in the clinical laboratory: • Definition of Administration. • Managerial duties and responsibilities.
Week 2	Administrative process: • Planning and organization. • Directing, controlling and decision making.
Week 3	Planning: Establishing policies and procedures: • Variations and Origin. • Characteristics.
Week 4	Design of Clinical Laboratory (1): • Space allocation. • Operational approach. • Structural design. • Modular design.
Week 5	Design of Clinical Laboratory (2): • Staffing. • Staff size. • Layout flow. • Operational flow.
Week 6	Organization of Clinical Laboratory • Specialization. • Scalar principle. • Unity of direction. • Unity of command & span of control.
Week 7	Laboratory Finance: • Cost: Fixed and variable. • Cost: Direct and Indirect. • Types of budget. • Budgeting for personnel expenses. • The role of the Laboratory manager
Week 8	Quality assurance:

	• Definition • Pre-analytical stage • Analytical stage • Post analytical stage
Week 9	Quality control: • Definition of terms • Internal quality control • External quality control • Quality control measures and statistics
Week 10	Biological sources of variation: • Genetic, sex, and age variation • Biorhythm and nutrition • Posture, physical activity, and non-periodic changes
Week 11	General control of laboratory investigations-1: • Rejection of specimens • calibration, duplicate and replicate tests • Check tests • control chart, • Data comparison • Precision and accuracy
Week 12	General control of laboratory investigations-2: • Data handling and data processing • Personal patient data record and keeping • Outlier test Delta check • Computers for control of laboratory performance
Week 13	Specific measures: • Clinical chemistry • Haematology
Week 14	Specific measures: • Histopathology and Cytology • Medical parasitology

Week 15	Specific measures: • Medical microbiology • Serology

References:

- El-Nageh M.M., Appel W., Engback K., Heuck C.C., Vandepitte J., Kallner A. (2002). Basics of quality assurance for intermediate and peripheral laboratories. 2nd edition. Cairo: World Health Organization.
- Gracia L.S. (2014). Clinical laboratory management. 2nd edition. Wasgington: American society of microbiology.
- John R. Snyder and Donald A. Senhauser. Administration and supervision in laboratory medicine. 2nd edition. J.B. Lippincott company, Philadelphia

Course title: Systematic Bacteriology

Course code: MCR354

Credit hours: 4(2+2)

Intended semester: (5)

Course duration: 15 weeks

Course description:

This course provides the students with a broad overview of medically important bacteria and different techniques used for isolation and identification of pathological bacteria.It coveres different Gram positive bacilli, Enterobacteracae , aerobic gram negative bacteria and microaerophilic bacteria (Campylobacter & Helicobacter) and It covered different Gram negative cocci and coccobacilli, Gram negative pyogenic bacteria, *Spirochaetes*, *Legionella*, *Mycobacteria*.

Course objectives:

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

1. Recognize the general properties of pathogenic bacteria, and their role in the causation of disease.
2. Identify the properties, pathogenecity, and infections caused by *Clostridia, Corynebacteria,* and *Bacillus species*& able to perform the diagnosis of these bacteria.
3. Discuss the laboratory diagnosis, transmission, and prevention of bacteria infection caused by *Listeria, Enterobacteria, Campylobacter, Helicobacter Pseudomonas, & Vibrio*.
4. Identify the properties of gram negative coccobacilli, eg. Bordetella, Pasteurella, and Francisella & able to perform the diagnosis of these organisms.
5. Perform laboratory diagnosis, and discuss classification, and pathgenicity of Haemophilus, Yersinia, Brucella, Neisseria, and Spirochaetes.
6. Discuss the properties, classification, species, and pathgenicity of Chlamydia, Rickettsia, Coxiella, and Mycoplasma and able to perform the laboratory diagnosis of these organisms
7. Perform laboratory diagnosis of Bacteroides, Fusobacterium, Leptotrichia, Aeromonas, Acinetobacter, Lactobacillus, Gardnerella, and Bartonella.

8. Discuss the pathogenesis, prevention, and features of Helicobacter, Moraxella, and Legionella, able to perform laboratory diagnosis of these bacteria.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignment

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Bacillus
Week (2)	Corynebacteria, Listeria and Erysipelothrix
Week (3)	Clostridia
Week (4)	Classification of gram negative rods, *Escherichia coli*
Week (5)	Klebsiella, Citrobacter and Enterobacter
Week (6)	Salmonella
Week (7)	Shigella
Week (8)	Proteus , Morganella, Providencia, and Serratia
Week (9)	Campylobacters species and *Helicobacter pylori*
Week (10)	Vibrios and Pseudomonas.
Week (11)	Classification of gram negative cocci and coccobacilli, and Yersinia
Week (12)	Zoonotic bacteria (Brucellaspecies,Pasteurella, Francisella, Spirillum & Streptobacillus
Week (13)	Gram negative pyogenic bacteria (Haemophilus & Bordetella, *Neisseria* &Moraxella.&Acinetobacter)
Week (14)	Spirochaetes; *Treponema pallidum, Borrelia* and *Leptospira*
Week (15)	Classification of Mycobacteria and *Mycobacterium tuberculosis, Mycobacteria leprae*

Practical:	
Week (1)	Laboratory diagnosis of Gram positive Bacilli (Bacillus, Corynebacterium, Clostridia)
Week (2)	Listeria and Erysipelothrix
Week (3)	Biochemical of gram negative rods, and diagnosis of *Escherichia coli*
Week (4)	Salmonella and laboratory diagnosis of enteric fever.
Week (5)	Shigella
Week (6)	Proteus ,Morganella, Providencia and Serratia
Week (7)	Klebsiella, Citrobacter and Enterobacter
Week (8)	Campylobacters species and *Helicobacter pylori*
Week (9)	Vibrios and Pseudomonas
Week (10)	Yersinia
Week (11)	Brucella and blood culture technique
Week (12)	Haemophilus.
Week (13)	Neisseria and bacteriological examination of CSF
Week (14)	Laboratory diagnosis of syphilis
Week (15)	Laboratory diagnosis of tuberculosis and leprosy

References:

1. Brook G. F., Butel J., Ornston L., Jawetz E., Melnick J., Adelberg E. (2007). Medical Microbiology. 20th edition. California: Appleton and long.
2. Cheesbrough, M. Distinct Laboratory Manual IN tropical countries. (2008). Revised 2nd edition. Cambridge: Cambridge University press.
3. Collee J. G., Marmion B. P., Fraser A. G.; Simmons A. (2007). Mackie and McCarteny Practical Medical Microbiology. 14th edition. New York: Elsevier science
4. Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: Systemic Chemical Pathology

Course code: CLN355

Credit hours: 3(2+1)

Intended semester: (5)

Course duration: 15 weeks

Course description:

This course covers the chemical pathology of urinary system, gastrointestinal tract, pancreas, and liver.

Course objectives:

16. Recognize the physiology and anatomy of renal system.
17. Identify the chemical background of renal function &renal diseases.
18. Numerate the types and causes of renal diseases
19. Perform the techniques used for assessment of renal function
20. Recognize the biochemistry of non-proteins nitrogenous (NPN) substances.
21. Discuss commonly encountered sources of analytical interference in non-proteins nitrogenous (NPN) substances.
22. Discuss the clinical significance associated with detecting abnormal levels of NPN metabolites.
23. Perform urine analysis.
24. Discuss the GIT anatomy, physiology and relevant tests for gastric, intestinal and pancreatic functions.
25. Identify the basis of liver anatomy and physiology.
26. Discuss the biochemical aspects of liver diseases.
27. Perform the laboratory methods applied for the analysis of liver function.
28. Discuss the types, laboratory findings and classification of jaundice.
29. Discuss the principle, interpretation and methods of liver function tests.

Instructional methods:

- Lectures
- Practical
- Tutorials and seminars

- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 20%
- Activities: 20%

Course contents:

Week (1)	Renal system • Anatomy • Review of Physiology • Formation of urine
Week (2)	Urinalysis-1 • Physical examinations • Chemical examinations • Deposits preparation • Microscopically. • Interpretation of urine results. • Diagnostic values.
Week (3)	Non-protein nitrogen metabolites-1 • Urea • Ammonia • Method of estimation
Week (4)	Non-protein nitrogen metabolites-2 • Creatine • Creatinine • Method of estimation • Uric acid • Method of estimation

Week (5)	Renal diseases (1) • Azotemia • Glomerular disease. • Nephritic syndrome.
Week (6)	Renal diseases (2) • Tubular disease • Rare inherited disorders of the renal tubules. • Diabetes insipidus & Syndrome of inappropriate secretion of ADH (SIADH) • Types and aspects of renal failure.
Week (7)	Renal calculi. • Causes & Formation. • Types of stones (or calculi) • Analysis.
Week (8)	Renal function tests. • Glomerular Function test • Tubular Function test
Week (9)	GIT anatomy and physiology • The muscular alimentary canal • The accessory digestive organs • The Role of GIT
Week (10)	Gastric juice analysis**:** • The stomach: Normal gastric function • Gastric fluid analysis • Hyperchlorhydria • Hypochlorhydria • Disorder related to gastric function

Week (11)	Pancreas: • Pancreas anatomy and physiology. o The pancreas anatomy o Normal pancreatic function o Assessment of pancreatic function Investigation of pancreatic disorders as exocrine gland**:** • Disorder of pancreatic exocrine function o Acute pancreatitis o Chronic pancreatitis o Measurement of pancreatic enzymes: serum amylase & serum lipase.
Week (12)	Intestinal function, disorders, and lab. diagnosis**:** • The small intestine: Normal intestinal function • Disordered of small intestine function • Assessment of intestinal function • D-xylose absorption test
Week (13)	Liver: • Liver Anatomy. • Physiology. • Liver functions • Liver Function tests.
Week (14)	Jaundice: • Bilirubin: o Metabolism o Disorder of Bilirubin metabolism. o Functions measurement o Specimen requirements • Jaundice**:** o Definition o Classification o Diagnosis

Week (15)	Liver diseases: • Acute liver failure • Hepatitis • Cirrhosis • Alcoholic liver disease • Primary liver cancer • Uncommon liver diseases. • Hereditary diseases

Practical:

Week (1)	Urinalysis; • Urine collection and preservatives. • (physical and chemical examination).
Week (2)	Urinalysis: • Microscopical examination.
Week (3)	Estimation of blood urea: • Chemical method • Enzymatic method
Week (4)	Estimation of blood creatinine: • End point
Week (5)	Estimation of blood creatinine: • Kinetic method) • Creatinine clearance
Week (6)	Estimation of blood Uric acid: • Chemical method • Enzymatic method
Week (7)	**C**ase study: Chronic renal failure.
Week (8)	Xylose absorption test.
Week (9)	Occult blood.
Week (10)	Estimation of amylase.
Week (11)	Case study: GIT disorders.

Week (12)	Liver function test
Week (13)	Liver function test**:** estimation of total protein, Albumin & calculation of globulin, total & direct bilirubin
Week (14)	Liver enzymes-1**:** • Estimation of Alkaline phosphatase
Week (15)	Liver enzymes-2: • Estimation of alanine transaminase & aspartate transaminase

References:

- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.
- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Tissue staining techniques II

Course code: HST356

Credit hours: 3(2+1)

Intended semester: (5)

Course duration: 15 weeks

Course description:

This course provides the students with the basic knowledge of the different methods of demonstration of connective tissue, pigments, and neuroendocrine systems.

Course objectives:

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

1- Deal with, and select special procedures applied to differential diagnosis (special stains)
2- Perform applications, uses and quality control of different special staining procedures used to demonstrate specific materials and structures in histological sections.
3- Acquire skills and performing all procedures of tissue processing including fixation, decalcification, electron microscope, routine staining (H and E) and special stain for demonstration of different materials in tissues.
4- Acquire skills and performing all procedures of special stain for demonstration of different materials in tissues.
5- Provide the components and types of connective tissue and the different methods that used for demonstration of connective tissue fibers, and diagnostic application of connective tissue fibres.
6- Discus the types of pigments and minerals (classification, methods of demonstration of endogenous and exogenous pigments, and the techniques used to remove the artifacts pigments).
7- Perform and discus the components of APUD system and the different methods used for demonstration of neuroendocrine cells.

Instruction methods:

- Lectures
- Practical

- Tutorials and seminar
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week 1	**Connective tissues:** • Definition • Functions • Types • Components
Week 2	**Collagen fibers:** • Formation • Types • Methods of demonstration (trichrome stains, and Heidenhain's stain) • Applications in pathology
Week 3	**Elastic fibers:** • Formation • Types • Methods of demonstration.(Verhoff's Haematoxylin, Orcein methos, Weigert's resorcin- fuchsin method, and aldehyde fuchsin method) • Applications in pathology
Week 4	**Reticular fibers:** • Formation • Types • Diagnostic applications of the fibers • Methods of demonstration (silver impregnation technique: Gordon and Sweets' method, and Gomori method) • Applications in pathology

Week 5	**Tutorial:** connective tissues

Week 6	**Pigments and minerals:**
	• Definition
	• Classification
	• Haematogenous pigment:
	  • biological sifnificance
	  • methods of demonstration
	  • Pathological applications)

Week 7	**Non-haematogenous endogenous pigments and Endogenous minerals:** • Biological significance • Method of demonstration • Pathological applications
Week 8	**Artifacts pigments:** • Method of demonstration • Pathological applications
Week 9	**Exogenous pigments:** • Method of demonstration Pathological applications
Week 10	**Tutorial:**pigments and minerals
Week 11	**Neuroendocrine system:** • Definition • Characteristics of neuroendocrine cells • Morphology of cell • Biology
Week 12	**Distribution and function of regulatory peptides:** • Anterior pituitary cells • Pancreatic endocrine system • Thyroid gland • Gastrointestinal tract • Lungs.
Week 13	**Pathological conditions associated with neuroendocrine system**
Week 14	**Techniques for the demonstration of neuroendocrine cells**

Week 15	Tutorial

Practical:	
Week 1	Haematoxylin and eosin (wiegerts haematoxylin)
Week 2	Vangieson technique for collagen fiber
Week 3	Masson trichrome for collagen fiber
Week 4	Verhoeff's haematoxylin for elastic fiber
Week 5	Gordon & Sweet's for reticular fiber
Week 6	Perl's Prussian blue for Haemosidrin pigment
Week 7	Modified fouchet technique for liver bile
Week 8	Schmorl's reaction for Melanin pigment
Week 9	Masson Fontana for melanin
Week 10	Tutorial
Week 11	Ferrous iron uptake for melanin
Week 12	Von kossa for calcium
Week 13	Silver technique for neuroendocrine cells
Week 14	PAS for neuroendocrine cells
Week 15	Tutorial

References:

- Prasad S.R. (2011). Practical histology for medical students. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.

- Suvarna K., Layton C., Bancrofti J.D. (2012). Bancrofti's Theory and practice of histological techniques. 7th edition. London: Churchill Livingstone.
- Young B. Stewart W., O'Dowd G. (2009). Wheather's basic pathology: a text, atlas, and review of histopathology. 5th edition. London: Chuchill Lvingstone.

SEMESTER SIX

Course title: Blood and tissue protozology

Course code: PRA361

Credit hours: 3(2+1)

Intended semester: (6)

Course duration: 15 weeks

Course description:
This course provides the students with intensive information about blood and tissue protozoa, in term of: classification, morphology, pathogenicity, laboratory diagnosis, control and treatment.

Course objectives:

1. Demonstrate adequate knowledge about the principles of basic parasitological techniques.
2. Practice the basic parasitological techniques used in the diagnosis of blood and tissue parasites
3. Discuss the biology, basic pathology, and epidemiology of Plasmodium spp. as well as the laboratory diagnosis of malaria
4. Recognize the biology of Toxoplasma and the clinical presentation and laboratory diagnosis of toxoplasmosis.
5. Demonstrate adequate knowledge about the biology as well as practicing the parasitology diagnosis of different coccidian and ciliated parasites of man.

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Course contents:

Week (1)	Quality control of blood examination for parasite
Week (2)	Stains used in blood examination
Week (3)	Plasmodium spp. • Biology.

	• Taxonomy • General characteristics
Week (4)	Plasmodium falciparum- falciparum malaria • Pathology • Differantioal diagnosis
Week (5)	Plasmodium vivax • Pathology • Differantioal diagnosis
Week (6)	Plasmodium malariae& Plasmodium ovale • Pathology • Differantioal diagnosis
Week (7)	MALARIA Seminar
Week (8)	Tutorial
Week (9)	Piroplasma
Week (10)	Toxoplasma and Toxoplasmosis • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (11)	Leishmania I (coetaneous Leishmaniasis) • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (12)	Leishmania II (Visceral Leishmaniasis) • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis

	• Control
Week (13)	Leishmaniasis in Sudan (seminar)
Week (14)	Trypanosoma I (African Trypanosomiasis) • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control
Week (15)	Trypanosoma I (American Trypanosomiasis) • Taxonomy • Lifecycle • Pathology • Laboratory diagnosis • Control

Practical:	
Week (1)	Collection of blood and film preparation for the diagnosis of malaria
Week (2)	Staining of blood films for the diagnosis of malaria parasites
Week (3)	Examination of blood for malaria parasite
Week (4)	Plasmodium falciparum (all stages)- Diagnosis of falciparum malaria
Week (5)	Plasmodium vivax (all stages)
Week (6)	Plasmodium malariae& Plasmodium ovalae (all stages)
Week (7)	Tutorial
Week (8)	lab test
Week (9)	Babsia and other piroplasma
Week (10)	Toxoplasma gondii (all stages)
Week (11)	Diagnosis of coccidian diarrhea
Week (12)	Diagnosis of other coccidian infections
Week (13)	Diagnosis of ciliated parasites
Week (14)	Field survey
Week (15)	Uncommon presentation of protozoan parasites (visual presentation)

References:

- Arora D.R., Arora B.B. (2014). Medical parasitology. 4th edition. New Delhi: CBS publishers & distributors.
- Day N.C., Dey T.K., Dey S.M. (2010). Medical parasitology. 11th edition. London: New central book agency (P) Ltd.
- John D.T., Petrr W.A. (2006). Markell and Voge's medical parasitology. 9th edition. Philadelphia: Elsevier.

Course title: Body fluid analysis

Course code: FLD362

Credit hours: 3(2+1)

Intended semester: (6)

Course duration: 15 weeks

Course description:

The course covers the routine laboratory investigations. It enable the students to perform analysis of body fluids including blood, urine, cerebrospinal fluid, sputum, pleural fluid, pericardial fluid, ascitic fluid, and hydrocele fluid, and semen.

Course objectives:

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

1. Identify the principles of different methods applied for body fluid analysis
2. Perform laboratory procedures concerning with body fluid analysis
3. Interpret results of body fluid analysis tests
4. Recognize pathological conditions associated with abnormalities of body fluids

Instruction methods:

- Lectures
- Practicals
- Audio-visual presentations
- Group discussions
- Tutorial

Evaluations:

- Theoretical examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to body fluid analysis
Week (2)	Urine examination-1

Week (3)	Urine examination-2
Week (4)	Stool examination-1
Week (5)	Stool examination-2
Week (6)	Sputum
Week (7)	Routine investigations-1
Week (8)	Routine investigations-2
Week (9)	CSF analysis-1
Week (10)	CSF analysis--2
Week (11)	Pleural fluid
Week (12)	Pericardial fluid
Week (13)	Ascitic and hydrocele fluid
Week (14)	Semen analysis-1
Week (15)	Semen analysis-2

Practical:

Week (1)	Urine examination
Week (2)	Urine examination
Week (3)	Stool examination
Week (4)	Stool examination
Week (5)	Haemoparasites
Week (6)	Routine investigations
Week (7)	Routine investigations
Week (8)	CSF analysis
Week (9)	CSF analysis
Week (10)	Pleural fluid

Week (11)	Pericardial fluid
Week (12)	Ascitic and hydrocele fluid
Week (13)	Semen analysis
Week (14)	Semen analysis
Week (15)	Tutorial

References:

- Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
- Cheesbrough, M. Distinct Laboratory Manual IN tropical countries. (2008). Revised 2nd edition. Cambridge: Cambridge University press.
- Pagana K.D., Pagana T.J. Mosby's manual of diagnostic and laboratory tests. 3rd edition. Philadelphia: Elsevier.
- Sood R. (2015). Concise book of medical laboratory technology: methods and interpretations. 2nd edition. London: The health sciences publisher.

Course title: Enzymology, Endocrinology**,** and Toxicology

Course code: CLN363

Credit hours: 3(2+1)

Intended semester: (6)

Course duration: 15 weeks

Course description:

This course covers the pathological conditions related to body enzymes and hormonal system. It also covers the effect of toxic chemicals and drugs on body system and monitoring methods.

Course objectives:

1. Describe the nature of enzymes and definitions of terms related to enzymology (Co-enzymes, Co-factors, activators, and inhibitors).
2. Describe the structure of the enzyme and the function of active and allosteric site of the enzyme.
3. Discuss the factors affecting enzymatic reaction.
4. Discuss the basic facts of clinical enzymology.
5. Discuss the uses of enzymes as diagnostic tools.
6. Describe the chemical makeup of specific hormones, nature, classification, mode of action and method of analysis.
7. Differentiate between primary and secondary hormonal disorders in terms of causes.
8. Correlate patient endocrine test results with clinical pathology
9. Discuss thyroid disorders
10. Know the laboratory diagnosis of thyroid disorders
11. Discuss adrenal gland disorders.
12. Discuss the laboratory investigations of hyper and hypo adrenalism.
13. Define vitamins and their role in the body.
14. Identify the basics of toxicology.
15. Discuss the toxicity of carbon monoxide, cyanide, acetaminophen, and acetyl salicylic acid.
16. Measure CO and acetyl salicylic in blood sample.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities : 20%

Course contents:

Week (1)	Introduction to Enzymology: • Definition of enzyme, co-factor, coenzyme, activators, and inhibitors • Enzyme structure and factors affect enzymatic reaction. • Methods used to measure enzymatic activity • Units of enzymes measurement
Week (2)	Clinical enzymology**:** • Location of enzymes • Liver enzymes • Muscle enzymes
Week (3)	Clinical Enzymology: • Cardiac enzymes • Bone enzymes • Use of enzymes as diagnostic tools, reagents and enzyme immunoassay methods
Week (4)	Endocrinology: • Definition of hormone, types of hormones, and hormonal action • Regulation of hormones • Types and causes of endocrine disorders

Week (5)	Hypothalamus and Pituitary**:** • Hypothalamic pituitary axis • Functions of pituitary hormones • Disorders of G.H secretion
Week (6)	Thyroid gland**:** • Functions and regulation of thyroid hormones • Hyperthyroidism & Hypothyroidism • Laboratory investigation of thyroid disorders
Week (7)	Adrenal Gland (Adrenal cortex)**:** • Functions and regulation of adrenal hormones • Disorders of adrenal cortex (Hypoadrenalism & Hyperadrenalism) • Laboratory investigations of adrenal cortex disorders
Week (8)	Adrenal Gland (Adrenal medulla): • Functions and regulation of catecholamine's • Disorders of catecholamine's secretion • Laboratory investigations of adrenal medulla disorders
Week (9)	Vitamins (Fat-soluble vitamins)**:** • Functions of vitamins • Fat-soluble vitamins • Daily requirement and diseases related to fat-soluble vitamin deficiency
Week (10)	Vitamins (water-soluble vitamins)**:** • Water-soluble vitamins • Daily requirement and diseases related to fat-soluble vitamin deficiency • Methods used to measure vitamins in serum

Week (11)	Toxicology-1: • Introduction to toxicology • Chemicals causing tissue hypoxia • Toxicity of heavy metals • Laboratory investigation of certain chemicals (CO & CN)
Week (12)	Toxicology-2: • Toxicity of therapeutic drugs • Acetaminophen, Aspirin, Antibiotics
Week (13)	Quality control-1: • Introduction to Q.C and Definitions • Pre-analtyical, analytical, and post –analytical precautions for clinical chemistry investigations
Week (14)	Quality control-2: • Calculations of mean, SD, CV and their uses in Q.C • Levy -Jennings chart
Week (15)	Tutorial

Practical:	
Week (1)	Operation of spectrophotometer (Kinetic Vs Endpoint)
Week (2)	Case study: liver enzyme- viral hepatitis)
Week (3)	Case study: cardiac enzymes- acute myocardial infarction)
Week (4)	Case study: muscle enzymes
Week (5)	Case study: thyroid disorder -hyperthyroidism.
Week (6)	Case study: thyroid disorder–hypothyroidism
Week (7)	Case study: Cushing's disease
Week (8)	Case study: Addison disease
Week (9)	Case study: vitamin deficiency
Week (10)	Case study: hyper vitaminosis D
Week (11)	Principles of toxicity screening
Week (12)	Case study: alcohol toxicity
Week (13)	Case study: aspirin toxicity

Week (14)	Standard curve
Week (15)	Levy –Jennings chart

References:

- Campbell P.N., Smith A.D., Peters T.J. (2005) Biochemistry illustrated. 5th edition. Philadelphia: Elsevier Ltd.
- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.
- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Genetics

Course code: GEN364

Credit hours: 3(2+1)

Intended semester: (6)

Course duration: 15 weeks

Course description:

This course covers the inheritance patterns, structure of chromosome and nucleic acids, gene expression, quantitative and qualitative chromosomal variations, genetics analysis in individuals and population, the genetics techniques, and the medical ethics in genetics analysis.

Course objectives:

By the end of the course the student will be able to:

1. Describe the different patterns of inheritance.
2. Discuss the basic anatomy and organization of human chromosomes.
3. Describe the structure of chromosome
4. Identify the basic nomenclature used to describe chromosomal aberrations.
5. Describe the structure of nucleic acids and the process of gene expression
6. Apply the techniques used to visualize chromosomes and FISH.
7. Discuss the major clinical consequences of chromosomal disorders.
8. Identify the genetic base of human cancer.
9. Discuss the medical ethics of genetics analysis

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to genetics
Week (2)	Pattern of inheritance: Mandlian inheritance
Week (3)	Pattern of inheritance: non-Mandlian inheritance
Week (4)	Chromosome organization and molecular structure
Week (5)	Structure of nucleic acids
Week (6)	Gene expression
Week (7)	Variations in chromosome numbers
Week (8)	Variations in chromosome structure
Week (9)	Genetic analysis of individuals and population: population genetics
Week (10)	Genetic analysis of individuals and population: genetics and cancer
Week (11)	Genetic analysis of individuals and population: quantitative genetics and evolutionary genetics
Week (12)	Genetics techniques: Karyotyping
Week (13)	Genetics techniques: Flourescent in-situ hybridization (FISH)
Week (14)	Genetics techniques: Recobinant DNA technology
Week (15)	Ethics in medical genetics

Practical:	
Week(1)	Orientation
Week(2)	Tisuue culture-1
Week(3)	Tisuue culture-2
Week(4)	Tisuue culture-3
Week(5)	Tutorial
Week(6)	Cytogentics analysis-1
Week(7)	Cytogentics analysis-2

Week(8)	Cytogentics analysis-3
Week(9)	Molecular cytogenetics techniques: FISH
Week(10)	Molecular cytogenetics techniques:M-FISH
Week(11)	Molecular cytogenetics techniques: CGH
Week(12)	Molecular techniques: PCR
Week(13)	Molecular techniques: Microarray
Week(14)	Antenatal test
Week(15)	Human cloning.

References:

- Brooker R.J (2012). Genetics: analysis and principles. 4th edition. New York: Mc Grau Hill.
- Hawkins J.D. (2000), Gene structure and expression. 3rd edition. Cambridge: Cambridge university press.
- Starr C, Taggart R, Evers C, Starr L (2013). 13th edition. Cell biology and genetics: the unity and diversity of life. New York: cengage learning

Course title: Immunohaematology & Haemostasis

Course code: HEM365

Credit hours: 3(2+1)

Intended semester: (6)

Course duration: 15 weeks

Course description:

This course covers the antigen-antibody reactions related to blood cells. It provides students with basic information about blood group systems, donor selection, blood components, and adverse transfusion reactions. In addition, it covers normal mechanisms and pathology of haemostatis.

Course o**bjectives:**

1. Define immunity and describe types of immunity.
2. Describe the structure and function of antigen and antibody.
3. Identify the complement system pathways.
4. Identify the types of antigen antibody reactions and factors influencing antigen antibody reactions.
5. Describe ABO blood group system antigen and antibodies and discuss their clinical significance.
6. Perform direct and indirect ABO grouping.
7. Determine ABO phenotype and possible genotypes .
8. Identify causes of ABO discrepancies.
9. Describe the nomenclature, theories of inheritance, genotype and phenotype of the Rhesus blood group system.
10. Perform Rhesus phenotyping and genotyping as well as D^U method.
11. Identify the applications and methodologies of the serological techniques including Saline, Antihuman globulin, Albumin and enzyme techniques.
12. Numerate donor selection criteria.
13. Describe the anticoagulants used in blood bank.
14. Describe preparation, storage and indications of bloodcomponents.
15. Describe preparation, storage and indications of plasma component and products.
16. Perform cross matching and interpret the result.

17. Perform and understand the aim, principle, procedure of antibody screening, identification, titration and elution and interpret the result.
18. Discuss immunological and non-immunological adverse transfusion reactions.
19. Define haemolytic disease of newborn (HDN) and describe their causes, pathphysiology, and diagnosis.
20. Identify the human leukocyte antigens (HLA) and human platelet antigens (HPA).
21. Identify the applications and methodologies of the tissue typing technique.
22. Describe and apply the quality control procedures used in blood bank.

Instructional methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	**Introduction to Immunohaematology:** • Definition of Immunohaematology • Definition and types of immunity • Antigen • Antibody • Complement
Week (2)	**Antigen antibody reactions:** • Types of antigen antibody reactions • Factors influencing antigen antibody reactions

Week (3)	**ABO blood group system:** • ABO antigens • Genetic and formation of ABO antigens • Subgroups • ABO antibodies • Clinical significance of ABO antibodies • ABO grouping
Week (4)	**Rhesus blood group system:** • Nomenclature • Antigens • Theories of inheritance • Genotypes and phenotypes • D variants • Antibodies • Clinical significance • Rh grouping and D^u method
Week (5)	**Other blood group systems (antigens, antibodies and clinical significance):** • Kell blood group system • Kidd blood group system • Duffy blood group system • Lewis blood group system • Lutheran blood group system • MNSs blood group system • P blood group system
Week (6)	**Serological techniques:** • Saline techniques • Antihuman globulin techniques • Albumin technique • Enzyme technique

Week (7)	**Donor selection and pre-transfusion tests** • Donor selection criteria • Phlebotomy • Anticoagulants used in blood bank and blood storage • Compatibility testing
Week (8)	**Blood components (preparation, storage and indications)** • Whole blood • Packed red blood cells • Platelet concentrate • Fresh frozen plasma • Cryoprecipitate • Coagulation factors concentrates
Week (9)	**Adverse transfusion reactions:** • Immunological reactions • Non-mmunological reactions
Week (10)	**Haemolytic disease of newborn (HDN):** • Definition • Causes • Pathophysiology • Clinical features • Laboratory diagnosis • Prophylaxis
Week (11)	**Primary haemostasis** • Blood vessels • Platelets
Week (12)	**Secondary haemostasis** • Coagulation system • Fibrinolytic system
Week (13)	**Platelet disorders:** • Quantitative disorders • Qualitative disorders

Week (14)	**Haemophilia and von Willebrand disease:** • Definition • Inheritance • Classification • Clinical features • Laboratory diagnosis
Week (15)	**Thrombophilia:** • Definition • Acquired thrombophilias • Hereditary thrombophilias • Anticoagulant therapy

Practical:	
Week (1)	Orientation
Week (2)	Antigen antibody reactions
Week (3)	Direct ABO grouping
Week (4)	Indirect ABO grouping
Week (5)	Rhesus grouping and D^u method
Week (6)	Rhesus phenotyping and genotyping
Week (7)	Albumin technique
Week (8)	Direct and Indirect Coombs' test
Week (9)	Cross matching
Week (10)	Antibody screeningand identification
Week (11)	Antibody titration
Week (12)	Bleeding time and clotting time
Week (13)	Prothrombin time and INR
Week (14)	Activated partial thromboplastin time
Week (15)	Thrombin time and Fibrinogen level

References:

1. Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
2. Daniels G. Human blood groups. (2002). 2nd edition. Oxford: Blackwell science Ltd.
3. Hillyer C.D., Siberstein L., Ness P.M. Anderson K.C., Roback J.D. (2009). Blood banking and transfusion medicine: basic principles and practice. 2nd edition. New Delhi: Elsevier Inc.
4. Hillier C.D., Silberstein L.., Ness P.M., Anderson K.C., Roush K.S. (2003). Blood banking and transfusion medicine: basic principles and practice. 1st edition. Philadelphia: Churchill Livingstone.

Course Title: Medical virology & mycology

Coursecode: MCR366

Credit hours: 3(2+1)

Intended semester: (6)

Course duration: 15 weeks

Course description:

This course provide the students with broad information about general properties and replication of viruses, epidemiology & immunity in viral infection, also this course gives the student information about general feature of fungi, fungal cell structure, classification & general reproduction, laboratory diagnosis of fungal infections (mycosis).

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course objectives:

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

1. Identify general properties of viruses.
2. Describe morphology, classification & replicative cycle of viruses.
3. Practice how to collect, transport and store clinical specimens, and how to recognize the infecting viruses in this specimen.
4. Perform different methods applied in laboratory diagnosis of viral infections (HIV and Hepatitis).
5. Describe different properties, classification, and structure of medical fungi.

6. Recognize different types of diseases caused by pathogenic fungi (mycoses) (superficial, cutaneous, subcutaneous,systemic and opportynistic mycoses).
7. Discuss pathogenesis, mode of transmission, laboratory diagnosis and treatment of commonly distributed and medical important pathogens.

Course contents:

Week (1)	History of virology
Week (2)	General properties, structure, and classification of viruses
Week (3)	Pathogenesis of medical viruses and viral replication
Week (4)	Laboratory diagnosis strategies of viral infections
Week (5)	Medical important RNA viruses 1.
Week (6)	Medical important RNA viruses 2.
Week (7)	Medical important DNA viruses 1.
Week (8)	Medical important DNA viruses 2.
Week (9)	Hepatitis viruses
Week (10)	HIV virus
Week (11)	Introduction to medical mycology.
Week (12)	Laboratory diagnosis of fungal disease (conventional and molecular methods)
Week (13)	Cutaneous mycosis (Ringworm fungi), and Superficial mycoses (Malassezia furfur)
Week (14)	Systemic mycosis
Week (15)	Opportunistic mycosis

Practical:	
Week (1)	Introduction to laboratory diagnosis of viral Infections.
Week (2)	Serological Methods (Classical Methods): Neutralization, Hemoaglutination and Complement fixation.
Week (3)	Serological Methods: Immunochromatography test.
Week (4)	Serological Methods: Immunoflourescent test.
Week (5)	Serological Methods: ELISA
Week (6)	Audio-visual demonstration: Molecular Methods
Week (7)	Viral nucleic acid extraction.
Week (8)	Polymerase chain reaction (PCR).
Week (9)	Virus Isolation-1: Cell culture preparation, and inoculation)
Week (10)	Virus isolation-2: CPE
Week (11)	Audio-visual demonstration- Fungi structure.
Week (12)	Collection of clinical specimens for fungal diagnosis
Week (13)	Laboratory diagnosis of superficial mycosis
Week (14)	Laboratory diagnosis of cutaneous mycosis: specimens collection and microscopical examination
Week (15)	Laboratory diagnosis of cutaneous mycosis: culture and identification

References:

- Arora D.R., Arora B.B. (2014). Medical mycology. 1st edition. New Delhi: CBS publishers and distributors Pvt Ltd.
- Brook G. F., Butel J., Ornston L., Jawetz E., Melnick J., Adelberg E. (2007). Medical Microbiology. 20th edition. California: Appleton and long.
- Dimmock N.J., Easton A.J., Leppard K.N. (2001). Introduction to modern virology. 5th edition. London: Blackwell science.
- Wanger E.K. Hewlett M.J. (1999). Basic virology. 1st edition. Massachusetts: Blackwell publishing.

Course title: Diagnostic Cytology

Course code: HST367

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course covers the principles and practice aspects of diagnostic cytology in benign and malignant conditions.

Course objectives:

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

1- Describe the general and basic principles and practical aspects of diagnostic cytology
2- Provide students with theoretical knowledge and practical skills to work in Cytopathology departments, research laboratory, and colleges.
3- Describe methods of cytology specimen collection, preservation, fixation, and staining.
4- Describe inflammatory condition and the common cause of inflammation in the female genital tracts(bacteria, parasites, and viruses)
5- Describe of the components of a normal cervical smear, and to recognise epithelial cells derived from the ectocervix, endocervix and endometrium
6- Recognise vaginal flora, and common contaminants in cervical smears, and to be familiar with basic smear patterns eg. in puberty pregnancy and menopausal state
7- Evaluate the adequacy of a smear and to be able to identify unsatisfactory smears
8- Identify cytological presentation of acute non-specific cervicitis
9- Recognise the cytological characteristics of squamous epithelial cells shared from a focus of CIN 1t(LSIL), CIN 2(HSIL), CIN 3(HSIL), and aware of The definition of ASCUS and the criteria for recognising atypical squamous cells of undetermined significance in cervical smears
10- Recognize the main types of adenocarcinoma in the cervix and the histological presentation of adenocarcinoma (endocervical type).

11- Practice the Principle of sampling and fixation in Cytology, andrecognize different staining methods in Cytology, and to compare between different routine and special staining methods (cytocentrifugation, cell blocks ,…. Etc)

12- Discuss sampling methods, and recognize adequate smears, benign, and malignant conditions in respiratory cytopathology, effusion Cytopathology, and urine Cytopathology

13- Apply Fine Needle Aspiration Cytology (FNAC) procedure, and recognize its role in diagnostic pathology for the diagnosis of different pathologic processes.

Instruction Methods:

- Lecture
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%,
- Practical examination: 40%,
- Activities: 20%

Course contents:

Week 1	Introduction to cytology: specimen collection, fixation, and staining.
Week 2	Normal cytology of the FGT: Gynecological benign cells of epithelial origin (endometrial and endocervical cells).
Week 3	Gynecological Cytology: benign cells of non-epithelial origin and Cyclic Changes(Hormonal Cytology)
Week 4	Gynecological Cytology: inflammatory conditions in female genital tract
Week 5	Gynecological Cytology: pre-malignant lesions of female genital tract (dysplasia and dyskaryosis)
Week 6	Gynecological Cytology squamous intraepithelial lesions: atypical smear-malignant lesions of female genital tract (squamous carcinoma: carcinoma in-situ and invasive carcinoma)
Week 7	Glandular Intraepithelial lesions: malignant lesions of female genital tract (adenocarcinoma) and cells of the ovarian surface and fallopian tube and their

	malignancies
Week 8	Tutorial
Week 9	Cytological appearance of radiation, contraceptive pills and pernicious anemia, Reporting and Nomenclature, Cervical Cancer Screening
Week 10	Respiratory Tract Cytology and it is malignancies
Week 11	Urinary Tract Cytology and it is malignancies
Week 12	GIT Cytology and it is malignancies
Week 13	Cytology of Body Fluids and Effusions(pleural, peritoneal and pericardium)
Week 14	Fine Needle Aspiration Cytology
Week 15	Tutorial
Practical:	
Week 1	Introduction to cytology (application, stains, fixation) normal gynecological Smear.benign cells of epithelial origin endometrial and endocervical cells
Week 2	Haematoxylin and Eosin staining (Buccal smear for barr bodies)
Week 3	Benign cells of non-epithelial origin: Romanwesky stain (Buccal smear)
Week 4	Cytology of menstrual cycle: Hormonal influence in gynecological smear.
Week 5	Inflammatory Gynecological Cytology(bacterial, parasitic and viral infections)
Week 6	Premalignant lesions: Dyskaryosis in Gynecological Smears.
Week 7	squamous intraepithelial lesions malignant gynecological smear: cells of squamous carcinoma in-situ, invasive carcinoma
Week 8	Glandular Intraepithelial lesions: adenocarcinoma and cells of the ovarian surface and fallopian tube and their malignancies, Screening 1
Week 9	Cytological appearance of radiation, contraceptive pills and pernicious anemia. Screening 2
Week 10	Cytology of respiratory tract: Sputum Smears.
Week 11	Pap Staining (urine sample) urine and CSF Smears.
Week 12	Cytology of gastrointestinal tract: GIT Smears.

Week 13	Normal and abnormal cells in body effusions***:*** Body Effusions Smears.
Week 14	Fine Needle Aspiration Smears.
Week 15	Tutorial

References:

- Dey P. (2014). Diagnostic cytology. 1st edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Suvarna K., Layton C., Bancrofti J.D. (2012). Bancrofti's Theory and practice of histological techniques. 7th edition. London: Churchill Livingstone.
- Young B. Stewart W., O'Dowd G. (2009). Wheather's basic pathology: a text, atlas, and review of histopathology. 5th edition. London: Chuchill Lvingstone.

SEMESTER SEVEN

Course tile: Systemic Microbiology

Course code: MCR471

Credit hours: 4(2+2)

Intended semester: (7)

Course duration: 15 weeks.

Course description:

This course covers the etiology and pathophysiological mechanism of infectious diseases, as well as, the protocols of clinical specimens collection and the techniques applied for diagnosing pathogenic micro-organisms.

Course objectives and learning outcomes:

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

1. Identify the micro-organisms causes infections of various body systems
2. Discuss the etiology and pathogenesis of systemic infections
3. Master laboratorytechniques applied for diagnosis of bacterial infections.
4. Practice how to Isolate pathogenic agents from urine stool, sputum, and wound, CSF and blood specimens
5. Practice how to diagnose throat, ear, and eye infections
6. Perform bacterial examination of water, food and milk**.**

Instructional Methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 45%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Urinary tract infections
Week (2)	Sexually transmitted infections-I: Gonorrhea, Vaginitis, and Candidosis
Week (3)	Sexually transmitted infections-II: Chlamydia, Syphilis, and Chanchroid
Week (4)	Gasrerointestinal tract infections-I: Diarrhea with mucus and Blood
Week (5)	Gasrerointestinal tract infectionsII: Watery diarrhea
Week (6)	Upper respiratory tract infections: Sore throat and tonsillitis
Week (7)	Lower respiratory tract infections: Pneumonia and bronchitis
Week (8)	CNS infections-I: Meningitis
Week (9)	CNS infections-I: Encephalitis and brain abscess
Week (10)	Ear infections and sinusitis
Week (11)	Eye infections
Week (12)	Skin and wound infections
Week (13)	Bacteraemia and septicaemia
Week (14)	Bacterial food poisoning: Effective and toxic food poisoning
Week (15)	Tutorial

Practical:

Week (1)	Laboratory diagnosis of unknown specimen.
Week (2)	Laboratory diagnosis of urinary tract infection
Week (3)	Laboratory diagnosis of sexually transmitted infections (gonorrhea, vaginitis, candidosis)
Week (4)	Laboratory diagnosis of sexually transmitted infections (chlamydia, syphilis, chanchroid)
Week (5)	Laboratory diagnosis of bloody diarrhea
Week (6)	Laboratory diagnosis of watery diarrhea
Week (7)	Laboratory diagnosis of sore throat and tonsillitis
Week (8)	Laboratory diagnosis of pneumonia and bronchitis.
Week (9)	Laboratory diagnosis of meningitis
Week (10)	Laboratory diagnosis of encephalitis and brain abscess

Week (11)	Laboratory diagnosis of otitis media and sinusitis
Week (12)	Laboratory diagnosis of conjunctivitis
Week (13)	Laboratory diagnosis of wound infections
Week (14)	Laboratory diagnosis of bacteraemia and septicaemia
Week (15)	Examination of food and water

References:

1. Brook G. F., Butel J., Ornston L., Jawetz E., Melnick J., Adelberg E. (2007). Medical Microbiology. 20th edition. California: Appleton and long.
2. Cheesbrough, M. Distinct Laboratory Manual IN tropical countries. (2008). Revised 2nd edition. Cambridge: Cambridge University press.
3. Collee J. G., Marmion B. P., Fraser A. G.; Simmons A. (2007). Mackie and McCarteny Practical Medical Microbiology. 14th edition. New York: Elsevier science.
4. Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: Advanced medical mycology

Course code: MCR472

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course provides the student with information about the general features of fungi, fungal cell structure, classification and general reproduction, laboratory diagnosis of fungal infections (mycosis). It also covers types of mycosis, its causative agents, pathogenesis, laboratory diagnosis and treatments.

Course objectives:

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

1. Describe different properties, classification, and structure of fungi.
2. Recognize different types of diseases caused by pathogenic fungi including superficial, cutaneous, subcutaneous, systemic and opportunistic mycosis.
3. Discuss pathogenesis, mode of transmission, laboratory diagnosis and treatment of commonly distributed and medically important fungi.
4. Perform various technical methods applied for the diagnosis of fungal infections.

Instruction methods:

- Lectures
- Practicals
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to medical mycology (Fungi definition, structure and classification)
Week (2)	Physiology of fungi, genetics, pathogenicity, toxin production and allergies
Week (3)	Laboratory diagnosis of fungal disease: conventional and molecular methods.
Week (4)	Cutaneous mycosis**:** Ringworm fungi-1
Week (5)	Cutaneous mycosis**:** Ringworm fungi-2
Week (6)	Superficial mycosis: Malassezia furfur and Fungicauses Piedra
Week (7)	Opportunistic mycosis: Fungi causes candidiasis
Week (8)	Opportunistic mycosis: Fungi causes aspergillosis
Week (9)	Opportunistic mycosis: Cryptococcosis and Zygomycosis
Week (10)	Subcutaneous mycosis: Fungi that cause mycetoma
Week (11)	Subcutaneous mycosis: Fungi that cause Chromomycosis and sporotrichosis
Week (12)	Systemic mycosis: Fungi causes Histoplasmosis and Blastomycosis
Week (13)	Systemic mycosis: Fungi causes Coccidioidomycosis and para-coccidioidomycosis
Week (14)	Anti-fungal therapy: Types, Mechanism of action, Sensitivity testing, and resistance
Week (15)	Tutorial.

Practical:

Week (1)	Collection of clinical specimens for fungal diagnosis
Week (2)	Microscopic examination of fungi.
Week (3)	Serological assays of medical fungi
Week (4)	Fungi culture
Week (5)	Susceptibility testing
Week (6)	Laboratory diagnosis of superficial mycosis
Week (7)	Cutaneous mycosis: specimens collection and microscopical examination)
Week (8)	Cutaneous mycosis: culture and identification
Week (9)	Laboratory diagnosis of sporotrichosis and chromoblastomycosis
Week (10)	Laboratory diagnosis of mycetoma
Week (11)	Laboratory diagnosis of dimorphic mycosis.

Week (12)	Laboratory diagnosis of Candidosis
Week (13)	Laboratory diagnosis of Cryptococcosis
Week (14)	Laboratory diagnosis of mucormycosis
Week (15)	Laboratory diagnosis of asperigellosis

References:

- Arora D.R., Arora B.B. (2014). Medical mycology. 1st edition. New Delhi: CBS publishers and distributors Pvt Ltd.
- Brook G. F., Butel J., Ornston L., Jawetz E., Melnick J., Adelberg E. (2007). Medical Microbiology. 20th edition. California: Appleton and long.
- Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: Clinical Parasitology

Course code: PRA471

Credit hours: 4(2+2)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course demonstrate adequate and detailed knowledge about clinical parasitology, it covers the pathogenesis, pathology, clinical presentations, complications, diagnosis, and prognosis, as well as epidemiology and control of the prescribed parasitic infections, as well as, administration and pharmacokinetic of drugs used for treatment of parasitic infections.

Course objectives and learning outcomes:

By completion of this course student will be able to:

1. Describe pathogenesis of different parasitological diseases
2. Numerate clinical presentations of common protozoa and worms infections
3. Discuss complications of parasitic infections
4. Identify drugs used for treatment of parasitic infections
5. Discuss methods of parasitic infections control

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	General concepts of parasite pathogenesis
Week (2)	Malaria I: Classical disease
Week (3)	Malaria II: Complicated malaria
Week (4)	Coetaneous Leishmaniasis
Week (5)	Visceral Leishmaniasis
Week (6)	Toxoplasmosis
Week (7)	Intestinal protozoa
Week (8)	African and American Trypanosomiasis
Week (9)	Schistosomiasis I: Intestinal
Week (10)	Schistosomiasis II: Urinary
Week (11)	Intestinal nematodes
Week (12)	Nematodes
Week (13)	Onchocerciasis
Week (14)	Tapeworms
Week (15)	Intestinal and liver flukes

Practical:	
Week (1)	Quality control in parasitology laboratory
Week (2)	Quantifying malaria parasite
Week (3)	Laboratory diagnosis of Leishmaniasis
Week (4)	Laboratory diagnosis of Toxoplasmosis
Week (5)	Laboratory diagnosis of Coccidian diarrhoea
Week (6)	Laboratoryo diagnosis of Intestinal protozoa
Week (7)	Laboratory diagnosis of Tapeworms Identification methods of proglottids Preserving and transporting adult
Week (8)	Laboratory diagnosis of Intestinal and liver flukes Formal ether concentration method
Week (9)	Laboratory diagnosis of intestinal Schistosomiasis: Kato thick smear & Hatching techniques
Week (10)	Laboratory diagnosis of urinary Schistosomiasis: filtration method

Week (11)	Laboratory diagnosis of intestinal nematodes: Stoll egg counting method, McMaster slide counting method, and Larva detection methods
Week (12)	Floatation methods and stool egg counting method (McMaster slide counting method)
Week (13)	Laboratory diagnosis of Lymphatic filariasis
Week (14)	Laboratory diagnosis of Onchocerciasis
Week (15)	Examination of environmental subjects: Soil, Water, plants.

References:

- Arora D.R., Arora B.B. (2014). Medical parasitology. 4th edition. New Delhi: CBS publishers & distributors.
- Day N.C., Dey T.K., Dey S.M. (2010). Medical parasitology. 11th edition. London: New central book agency (P) Ltd.
- Spicer W.J. (2000). Clinical bacteriology, mycology, and parasitology: an illustrated colour text. London: Churchill Livingstone.
- Zeibig E. (2013). Clinical Parasitology. 2nd edition. Canada: Elsevier.

Course title: Medical Entomology

Course code: PRA472

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course provides the student with intensive information about insects and Arthropods taxonomy, classification, morphology, medical importance, laboratory identification and control.

Course o**bjectives:**

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

1. Demonstrate adequate knowledge about the scope of medical entomology.
2. Demonstrate adequate knowledge about the biological properties, route of transmission, and control of different insects and arthropods.
3. Identify the characteristics, classification, development, and the morphology of insects and arthropods.
4. Identify the various stages of different medical important insects and arthropods.
5. Discuss the role of different insects and arthropods in the causation of human diseases
6. Identify the modes of disease transmission
7. Apply the measures adopted for control and eradication of medically important insects and arthropods.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%

- Activities: 20%

Course contents:

Week (1)	• Definition and scope of medical Entomology • Disease transmission
Week (2)	• Classification and characteristics of arthropods • Arthropod development
Week (3)	• External morphology of insects
Week (4)	• Internal structure of insect
Week (5)	Order Diptera, - Suborder nematocera
Week (6)	Family Culicidae- Mosquitoes • Taxonomy • Life cycle • Medical importance • Laboratory identification
Week (7)	Control of mosquitoes
Week (8)	Family Psychodidae– Sand fly • Taxonomy • Lifecycle • Medical importance • Laboratory identification • Control
Week (9)	Family Simuliidae- Black fly, Family Ceratopogonidae • Taxonomy • Lifecycle • Medical importance • Laboratory identification • Control
Week (10)	Family Tabanidae- Horse fly,Family Chrysopidae- Deer fly • Taxonomy • Lifecycle

	• Medical importance • Laboratoryidentification • Control
Week (11)	Family Muscidae – House fly, Family Glossinidae • Taxonomy • Lifecycle • Medical importance • Laboratoryidentification • Control
Week (12)	Family calliphridae, Family Oestridae,Mayiasis • Taxonomy • Lifecycle • Medical importance • Laboratoryidentification • Control
Week (13)	Order Siphonaptera- Flaes • Taxonomy • Lifecycle • Medical importance • Laboratoryidentification • Control
Week (14)	Order Anopliura – Lice ,Order Hemiptera– Ticks • Taxonomy • Lifecycle • Medical importance • Laboratoryidentification • Control

Week (15)	Class Arachnida acarini– Mites • Taxonomy • Lifecycle • Medical importance • Laboratoryidentification • Control

Practical:	
Week (1)	Classification and general properties of arthropods
Week (2)	Morphology of insects
Week (3)	Entomology methods
Week (4)	Collection and preservation of arthropods
Week (5)	Mosquitoes – Anophelinie Demonstration
Week (6)	Mosquitoes- Culicine
Week (7)	Insectsides
Week (8)	Sand fly
Week (9)	Black fly
Week (10)	Horse fly- Crysops
Week (11)	House fly, Tsetse fly
Week (12)	Mayasis
Week (13)	Flea
Week (14)	Lice, mite & Ticks
Week (15)	Tutorial

References:

- Eldridge B.F., Edman J. (2003). Medical entomology: a textbook on public health and veterinary problems caused by Arthropods. 2nd illustrated revised edition. Springer science and business media.
- Mullen G., Durden L. (2002). Medical and veterinary Entomology. 1st edition. USA: Academic press
- Service M. (2012). Medical entomology. 1st edition. New York: Cambrige University press

Course title: Advanced chemical pathology I

Course code: CLN471

Credit hours: 4(2+2)

Intended semester: (7)

Course description:

This course covers carbohydrate, lipid and protein metabolism in health and disease and the role of the Laboratory in diagnosis and management of their disorders. This course also demonstrates adequate and detailed knowledge about renal disorders, clinical significance of non-protein nitrogen, liver disease, and proteins metabolism and disorder. In addition, this course provides a detailed knowledge about Calcium, magnesium and phosphorus homeostasis and disorders, fluids and electrolytes distribution, pathological aspects of intestinal function, assessment of acid- base homeostasis, blood gases and lung disease, and cardiovascular biomarkers.

Course objectives:

By completion of this course, student should be able to:

1. Discuss pathophysiology of carbohydrate metabolic disorders as well as protein and lipid disorders
2. Identify body distribution of calcium magnesium and phosphorus and describe homeostatic disorders
3. Discuss pathophysiology of renal, liver, respiratory, and cardiac disorders
4. Describe water and electrolytes regulation
5. Discuss principles of/ and perform body fluids analysis methods
6. Perform laboratory procedures apply in chemical pathology laboratory

Course contents:

Week (1)	Carbohydrate metabolism and fuel homeostasis: Pathophysiology and role of the laboratory in diagnosis and management of CHO disorders
Week (2)	Calcium magnesium and phosphorus: Distribution in the body, homeostasis, and disorders
Week (3)	lipids and lipoproteins: Metabolism and Disorders

Week (4)	Non-protein nitrogen (NPN)
Week (5)	Protein metabolism and disorders
Week (6)	Renal disorders: Pathophysiology and laboratory diagnosis
Week (7)	liver disorders: Biochemical changes in liver disease
Week (8)	Clinico-pathologic aspects of intestinal function
Week (9)	Water & Electrolytes: Regulation and anion gap
Week (10)	Assessing Acid base homeostasis
Week (11)	Blood gases and pH.
Week (12)	Assessment of cardiac disorders
Week (13)	Respiratory disorders
Week (14)	Body fluid analysis
Week (15)	Tutorial

Week (1)	Glycated Hemoglobin Estimation and abnormal GTT curves
Week (2)	Calcium magnesium & phosphorus "Case Study"
Week (3)	Estimation of HDL and LDL cholesterol ,and lipids & lipoprotein disorders "case study".
Week (4)	Caculation of BUN and Urea, Creatinine ratio.
Week (5)	Estimation of Ammonia.
Week (6)	Protein Electrophoresis and disorders "case study".
Week (7)	Renal disorders "case study"

Week (8)	liver disorders "case study".
Week (9)	GIT disorders: Breath tests and Occult blood fecal test.
Week (10)	Fractional excretion of sodium(FENa)
Week (11)	Lactate Estimation ,Acidosis and Alkalosis "case study"
Week (12)	Buffer making and pH estimation.
Week (13)	Cardiac Markers estimation and "case study".
Week (14)	Respiratory disorders "case study",
Week (15)	Tutorial.

References:

- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.
- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Quality control in clinical chemistry

Course code: CLN472

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course provides the students with detailed information about quality assurance and quality control applications in clinical chemistry laboratory.

Course objectives:

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

1. Define quality assurance, quality control, and related terms
2. Recognize the major facts, objectives and applications of quality assurance in clinical chemistry.
3. Define accuracy, precision, standardization procedures, and internal and external quality control.
4. Recognize types of biological variations related to interpretation of laboratory results in clinical chemistry
5. Identify technical sources of errors in clinical chemistry laboratory
6. Select and evaluate laboratory methods
7. Apply quality control procedures related to chromatography, electrophoresis and automation.
8. Discuss types, principles, applications, calibration, evaluation, and future of automated chemistry analyzers.
9. Identify principle, types, uses, and quality control of immunoassays
10. Describe in details the principle, production, significant, reliability, sensitivity, specificity, application and results interpretation of chromatography and electrophoresis technique

Instructional methods:

- Lectures

- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- ❖ Theory examination: 40%
- ❖ Practical examination : 40%
- ❖ Activities: 20%.

Course contents:

Week (1)	Quality assurance in clinical chemistry: • Definition of terms • Objectives of quality assurance
Week (2)	Quality assurance stages: • Pre-analytical stage • Analytical stage • Post-analytical stage
Week (3)	Biological variations related to interpretation of analytical results.
Week (4)	Technical sources of variation: • Pre-analytical variation. • Analytical variation. • Post-analytical variation
Week (5)	Types and causes of laboratory errors
Week (6)	Method selection and evaluation (1) • Precision study
Week (7)	Method selection and evaluation (2) • Accuracy study.
Week (8)	Method selection and evaluation (3) • Analytical sensitivity and specificity.
Week (9)	Control material and control chart
Week (10)	Internal and external quality control.

Week (11)	Standard operation procedure
Week (12)	Reference Values
Week(13)	Quality control of automated clinical chemistry analyzers
Week (14)	Quality control of immunoassays
Week(15)	Tutorial

Practical:	
Week (1)	Calibration of colorimeter (wavelength accuracy)
Week (2)	Calibration of colorimeter (photometer accuracy and baseline stability)
Week (3)	Calibration of automatic pipette.
Week (4)	Duplicate analysis
Week (5)	Replicate experiment
Week (6)	Recovery study
Week (7)	Interference study
Week (8)	Linearity check.
Week (9)	Comparison between methods.
Week (10)	Methods detection limit.
Week (11)	Performance and calculation of reference value.
Week (12)	Levey Jennings chart
Week (13)	Application 0f Westgard rules.
Week (14)	Cusum Chart
Week (15)	Tutorial.

References:

- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.
- Gracia L.S. (2014). Clinical laboratory management. 2nd edition. Wasgington: American society of microbiology.
- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Red blood cell disorders

Course code: HEM471

Credit hours: 4(2+2)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course provides the students with detailed information about definition, causes, pathogenesis, classification, clinical features, and laboratory diagnosis of red blood cells disorders, mainly anaemia and polycythaemia.

Course o**bjectives:**

5. Define anaemia and identify causes, pathophisiology, clinical features, and laboratory diagnosis of anaemia
6. Describe morphologicl and aetiologicl classification of anaemia
7. Discuss nutritional and physiological aspects of anaemia
8. Describe the causes, pathophisiology, clinical feature and laboratory diagnosis of iron deficiency anaemia.
9. Identify the principle of/ and perform iron profile and bone marrow iron stin.
10. Identify the causes of/ and describe the pathophisiology, clinical features, and laboratory diagnosis of megaloblastic anaemia and pernicious anaemia.
11. Identify the causes of macrocytic non-megaloblastic anaemia
12. Differentiate between macrocytic megaloblastic and macrocytic non-megaloblastic anaemias.
13. Define and classify haemolytic anaemias ,and describe evidence and mechanisms of haemolysis.
14. Numerate the haemolytic anaemias due to membrane defects and describe their causes, pathophysiology, clinical features and laboratory diagnosis.
15. Define haemoglobinopathy and describe its classification and the laboratory methods applied for haemoglobinopathy diagnosis.
16. Define sickle cell anaemia and describe its inheritance pattern, pathophisiology, clinical feature and laboratory diagnosis.

17. Define thalassemia and describe its inheritance pattern, classification, pathophisiology, clinical feature and laboratory diagnosis.
18. Numerate haemoglobinopathy other than sickle cell anaemia and thaassemia and describe the basic structural defects causes them.
19. Define G6PD deficiency anaemia and describe its inheritance pattern, pathophisioloiogy, clinical feature and laboratory diagnosis.
20. Numerate the causes of acquired haemolytic anaemias.
21. Define immune haemolytic anaemia and describe its classification, pathophysiology, clinical features and laboratory diagnosis.
22. Define paroxysmal nocturnal haemoglobinuria and describe its pathophisiology, clinical feature and laboratory diagnosis.
23. Describe the pathophisiology, clinical feature and laboratory diagnosis of anemia of chronic disease and naemia of blood loss.
24. Define polycythaemia and describe its classification, inheritance pattern, pathophisiology, clinical feature and the laboratory diagnosis.
25. Identify the principle of/ and perform all routine and special haematological tests applied for diagnosis of erythrocyte disorders.
26. Construct Levey- Jenning chart and interpret the results.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to anaemia: • Definition • Causes • Classification • Physiological body adaptation • Pathophysiology and clinical features • Laboratory diagnosis
Week (2)	Iron deficiency anaemia: • Iron physiology • Definition of iron deficiency anaemia • Incidence • Causes • Pathophysiology and clinical features • Laboratory diagnosis
Week (3)	Sideroblastic anaemia and lead intoxication: • Definition • Classification • Pathophysiology and clinical features • Laboratory diagnosis • Treatment
Week (4)	Megaloblastic anaemia • Physiology of vitamin B12 and folate • Definition of megaloblastic anaemia • Causes of vitamin B12 and folate deficiency • Pathophysiology • Clinical features • Laboratory diagnosis

Week (5)	Pernicious anaemia and macrocytic non-megaloblastic anaemia
	• Pernicious anaemia:
	  o Definition
	  o Causes
	  o Differential diagnosis
	• Macrocytic- non megaloblastic anaemia:
	  o Definition
	  o Causes

Week (6)	Introduction to haemolytic anaemia • Definition of haemolytic anaemia • Classification • Clinical features • Mechanism of haemolysis • Evidence of haemolysis
Week (7)	Haemolytic anaemia due to membrane defects (hereditary spherocytosis, elliptocytosis and stomatocytosis) • Definition • Inheritance • Causes and pathophysiology • Clinical features • Laboratory diagnosis

Week (8)	Introduction to haemoglobinopathies:
	• Definition of haemoglobinopathies
	• Classification
	• Laboratorymethods used for diagnosis of haemoglobinopathies:
	  o Hb- electrophoresis
	  o Chromatography

Week (9)	Sickle cell anaemia: • Definition • Inheritance • Pathophysiology and clinical features • Laboratory diagnosis • Treatment
Week (10)	Thalassemia: • Definition • Classification • Pathophysiology and clinical features • Laboratory diagnosis • Treatment
Week (11)	Glucose-6-phosphate dehydrogenase (G6PD) deficiency and Pyruvate kinase deficiency anaemia: • Definition • Inheritance • Pathophysiology and clinical features • Laboratory diagnosis • Treatment
Week (12)	Immune haemolytic anaemia: • Autoimmune haemolytic anaemia: o Definition o Classification o Pathophysiology and clinical features o Laboratory diagnosis o Treatment • Allo-immune haemolytic anaemia • Drug-induced immune haemolytic anaemia

Week (13)	Paroxysmal nocturnal haemoglobinuria and acquired haemolytic anaemia: • Paroxysmal nocturnal haemoglobinuria (PNH): o Definition o Causes o Pathophysiology and clinical features o Laboratory diagnosis • Other causes of acquired haemolytic anaemia
Week (14)	Anaemia of chronic disease and anaemia of blood loss: • Anaemia of chronic disease o Definition o Causes o Pathophysiology and clinical features o Laboratory diagnosis o treatment • Anaemia of blood loss: o Definition o classification o Causes o Laboratory diagnosis o Treatment
Week (15)	Polycythaemia: • Definition • Classification • Causes • Pathophysiology and clinical features • Differential diagnosis • Treatment

Practical:	
Week (1)	Complete blood count: normal sample
Week (2)	Complete blood count: microcytic hypochromic anaemia

Week (3)	Iron profile (serum iron and serum ferritin)
Week (4)	Iron profile(TIBC &TS%)
Week (5)	Bone marrow iron stain
Week (6)	Complete blood count: megaloblastic anaemia
Week (7)	Reticulocyte count
Week (8)	Osmotic fragility test
Week (9)	Haemoglobin electrophoresis
Week (10)	Sickling test and Hb-S solubility test
Week (11)	Hb-F estimation
Week (12)	Methemoglobin reduction test
Week (13)	Ham's test
Week (14)	Complete blood count: aplastic anaemia
Week (15)	Quality control: construction and interpretation of Levey-Jening chart

References

1. Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
2. Hoffbrand A.V., Moss P.H.A., Pettit J.E. (2006). Essential Haematology. 5th edition. Massachusetts: Blackwell publishing Ltd.
3. Steine-Martin E.A., Lotspeich-Steininger C.A., Koepke J.A. (1998). Clinical Haematology: principles, procedures, correlation. 2nd edition. Philadelphia: Lippincott-Raven publishers.

Course title: Blood transfusion

Course code: HEM472

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course covers the fundamentals of blood transfusion services establishment, donor selection, blood components preparation and uses, pre-transfusin testing and adverse transfusion reactions, as well as management and quality control applications in blood bank.

Course objectives:

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

1. Identify how to establish blood transfusion service
1. Numerate donor selection criteria.
2. Apply venesection and describe the anticoagulants used in blood bank.
3. Describe preparation, storage and indications of blood components.
4. Describe preparation, storage and indications of plasma component and products.
5. Discuss the principle of/ and perform cross matching and interpret the result.
6. Discuss the principle/ and apply the procedures of antibody screening, identification, titration and elution and interpret the result.
7. Discuss immunological and non-immunological adverse transfusion reactions.
8. Describe and apply the quality control procedures used in blood bank.

Instruction methods

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%

- Activities: 20%

Course contents:

Week (1)	Establishment of blood transfusion service
Week (2)	Donor selection criteria
Week (3)	Blood donation, anticoagulants, and storage
Week (4)	Types of blood transfusion
Week (5)	Pre-transfusion compatibility tests
Week (6)	Screening of blood transmitted diseases
Week (7)	Blood components: whole blood and red cell preparations
Week (8)	Blood components: granulocytes and platelet concentrates
Week (9)	Plasma components: fresh frozen plasma and cryoprecipitate
Week (10)	Plasma products: albumin, fibrinogen, and coagulation factors concentrates
Week (11)	Plasma substitutes
Week (12)	Immunological adverse transfusion reactions
Week (13)	Non- immunological adverse transfusion reactions
Week (14)	Aphresis
Week (15)	Blood bank management and quality assurance

Practical:	
Week (1)	ABO discrepancies
Week (2)	Rhesus phenotyping and genotyping
Week (3)	Serological techniques
Week (4)	Compatibility testing: compatible donor

Week (5)	Compatibility testing: incompatible blood
Week (6)	Compatibility testing: recipient with history of blood transfusion or pregnant lady
Week (7)	Compatibility testing: incompatibility due to autoantibody
Week (8)	Compatibility testing: transfusion to neonates
Week (9)	Preparation of blood components
Week (10)	Screening of blood transmitted diseases
Week (11)	Diagnosis of immediate haemolytic transfusion reactions
Week (12)	diagnosis of delayed haemolytic transfusion reactions
Week (13)	diagnosis of non-haemolytic transfusion reactions
Week (14)	Aphresis
Week (15)	Quality control in blood bank

References:

1. Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
2. Daniels G. Human blood groups. (2002). 2nd edition. Oxford: Blackwell science Ltd.
3. Hillyer C.D., Siberstein L., Ness P.M. Anderson K.C., Roback J.D. (2009). Blood banking and transfusion medicine: basic principles and practice. 2nd edition. New Delhi: Elsevier Inc.
4. Hillier C.D., Silberstein L.E., Ness P.M., Anderson K.C., Roush K.S. (2003). Blood banking and transfusion medicine: basic principles and practice. 1st edition. Philadelphia: Churchill Livingstone.

Course title: Advanced histopathological techniques

Course code: HST471

Credit hours: 4(2+2)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course covers the different types of tumor markers and their applications in pathology in breast and lymphoma. The course will also cover the application of microwave technology in histology, special biopsies (kidney), ins itu hybridization and cover the aspects of different techniques for neuropathology.

Course objectives:

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

1- Perform skills for all preparations of tissues and cells for microscopy
2- Define the immunoflourescent, describe the techniques used, and the diagnostic applications of it.
3- Describe the principle of immunofluorescent and the production and labeling of antisera.
4- Identify and discuss the features and nature of bacteria and other micro-organisms.
5- Perform the different methods used for demonstration of micro-organism in tissue sections(bacteria, mycobacterium, fungi, and viruses)
6- Recognize the role of microwave technology in histology.
7- Mention histological investigation of dementia
8- Provide the principle and application of insitu hybridization and overview of insituhybridization
9- Recognize and describe the different techniques for neuropathology
10- Describe tissue microarray technique and its application in histpathology laboratory

Evaluation : theory 40%, practical50%, activities 10%

Instruction methods:

- Lectures
- Practical

- Tutorials

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Oral examination: 20%

Course contents:

Week (1)	New and conventional methods for cells and tissue preparation
Week (2)	Cells and tissue preparation for special purposes in histopathology
Week (3)	**Immunoflourescence techniques:** • Principle • Fluorochrome dyes • Preservation of substrate
Week (4)	**Immunoflourescence techniques:** • Conjugates • Staining reactions • Diagnostic applications
Week (5)	**Histological demonstration of microorganisms:** • Definition of microorganisms • Classification of microorganisms
Week (6)	**Demonstration of bacteria:** • Gram stains • Warthin and starry method for Spirochaetes • Ziehl-Neelsen stain for tubercle bacilli • Wade-Fite technique for leprosy bacilli • Touldine blue for Helicobacter pylori • Immunohistochemistry • In-situ hybridization
Week (7)	**Identification of fungi:** • Grocott hexamine silver • Periodic acid schiff's (PAS) • Immunohistochemistry • In-situ hybridization
Week (8)	**Demonstration of Parasites:** • Giemsa stain • Immunohistochemistry • In-situ hybridization
Week (9)	**Demonstration of viral inclusions and Rickettsia:** • Macchavello's technique

	• Phloxine –tetrazine technique • Immunohistochemistry • In-situ hybridization
Week (10)	**Application of microwave technology to histology:** • Definition • Specification of laboratory grade microwave • Steps of microwave technology • Effect of microwave technology on tissues • Benefits of microwave on histo-technology
Week (11)	**Techniques in neuropathology:** • Anatomy,histology, and function of central nervous system • Cresyl violet Nissl stain • Immunohistochemistry of neurons: cytoskeleton protein • Immunohistochemistry of neurons: specific cytoplasmic proteins
Week (12)	**In-situ hybridization:** • Introduction • Principle • Methods (ISH, FISH, and C-ISH) • Applications
Week (13)	**Technical aspects of in-situ hybridization methods:** • Probe preparation, types, and labeling • Probe concentration and length • Sample preparation • Pre-hybridization and hybridization of the specimen • Detection methods, control and influence of fixatives
Week (14)	**Tissue Microarray**
Week (15)	**Tutorial**

Practical:	
Week (1)	Methods of sample preparation reception and selection of histopathological samples
Week (2)	Fixation, preparation of fixatives, and sample selection
Week (3)	Decalcification and manual tissue processing (dehydration and clearing, impregnation
Week (4)	Tissue processing: embedding of tissues
Week (5)	Microtome

Week (6)	Haematoxylin and eosin
Week (7)	Demonstration of bacteria by using routine and special stain
Week (8)	Demonstration of fungi using routine and special stains
Week (9)	Demonstration of viral inclusion bodies using routine and special stains
Week (10)	Demonstration of protozoan using routine and special stains
Week (11)	Demonstration of Mycobacterium tuberculosis using ZN stain
Week (12)	Demonstration of H.pylori using routine and special stains
Week (13)	Demonstration the Neuroendocrine system cells using routine and special stains
Week (14)	Demonstration the Neuroendocrine system using silver based stains
Week (15)	Tutorial

References:

- Buchwalow I.B. Bocker W. (2010). Immunohistochemistry: basics and methods. 2010th edition. London: Springer
- Ramos-Vara, JA 2005. "Technical Aspects of Immunohistochemistry".*Vet Pathol 2005;* 42(4): 405–426.
- Suvarna K., Layton C., Bancrofti J.D. (2012). Bancrofti's Theory and practice of histological techniques. 7th edition. London: Churchill Livingstone.
- Young B. Stewart W., O'Dowd G. (2009). Wheather's basic pathology: a text, atlas, and review of histopathology. 5th edition. London: Chuchill Lvingstone.

Course title: Enzyme and immunohistochemistry

Course code: HST472

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course provides the students with basic and routine staining techniques for demonstrating different microorganisms in tissue, and introduces the various techniques that are used in the preparation and evaluation of immunohistochemistry (IHC) slides(Procedures and terminology related to IHC are also discussed and strategies for troubleshooting problems are presented). This popular course covers basic enzyme and immunohistochemistry theory and practice. Learn the key elements to consider when utilizing endogenous enzyme blocks, protein blocks and biotin blocks. Discover tips for reducing background staining.

Course objectives:

1- Define the enzyme histochemistry techniques, classification of enzymes, enzymes nomenclature, and preparation of tissues for enzymes demonstration
2- Describe the types of enzymehistochemical reactions.
3- Describe the preparation of tissues for enzymes demonstration and types of enzymes histochemical techniques.
4- Discuss the diagnosticapplications of enzymehistochemistry
5- Discuss the methods of antigen retrieval, detection of low level antigen, blocking of background staining and endogenous enzymes, and controls in immunohistochemical staining
6- Gain all practical aspects of immunohistochemical techniques, and interpretation of immunohistochemical and the applications of tumour markers.
7- Gain all practical aspects of enzyme and immunohistochemical techniques, and interpretation of immunohistochemical results.
8- Understand the principle of immunocytochemistry and the different staining methods used in immunocytochemistry.
9- Define in-situ hybridization principle, and overview of in-situ hybridization.
10- Gain all practical aspects of enzymes and immunoflurescent techniques, and in situ hybridization.

11- Define tumor markers, and their diagnostic applications in diagnosis of tumors , and the application of tumor markers in pathology.

Instruction methods:

- Lectures
- Practical
- Tutorials and Seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities:20%

Course contents:

Week (1)	Introduction to enzyme histochemistry techniques, classification of enzymes and enzymes nomenclature, and preparation of tissues for enzymes demonstration (fixation and preservation of tissues and smears for enzymes demonstration).
Week (2)	Types of enzyme histochemical reactions (simultaneous capture, post incubation coupling, self-colored substrate and intra-molecular rearrangement), and the use of control.
Week (3)	Demonstration of phosphatases enzymes (metal precipitation and Azo dyes methods), esterases, and oxidasesenzymes (naphthyl acetate methods and indoxl acetate methods), and the diagnostic applications of enzymehistochemistry
Week (4)	Introduction to the immunohistochemistry, definition of antigen, antibodies, and antigen-antibody binding, Production and labeling of antibodies (polyclonal antibodies, monoclonal antibodies and labels)
Week (5)	Staining techniques of immunohistochemistry (direct, indirect method and enhanced polymer one step staining technique), Peroxidase antiperoxidase technique
Week (6)	Staining techniques of immunhistochemstry (immunogold silver, avidin-

	biotin, hapten labeling and mirror image method).
Week (7)	Controls in immunohistochemical staining (positive control, negative control and absorption control) and preservation of tissues for immunological staining (chemical fixation and physical fixation)
Week (8)	Immunohistochemistry antigen retrieval techniques (proteolytic enzymes method, microwave method and pressure cooker method)
Week (9)	Tutorial
Week (10)	Detection of low level antigens, and preservation of tissue for immunostaining
Week (11)	Blocking of background staining and endogenous enzymes.
Week (12)	Tumor markers (intermediate filaments and epithelial related markerss (vimentin, desmin, neurofilament, and glial fibrillary acid protein and epehelial tissue related markers)
Week (13)	Tumour markers keratin positive tumour and vimentin positive(keratin negative tuomour) and tumor markers for lymphomas (clustered antibodies) and germ cell tumor markers(placental alkaline phosphatase, alpha fetoprotein, human placental lactogen, and HCG)
Week (14)	Mesenchymal tissue markers(smooth muscle actin, s100 protein, and melanoma specific antigen)
Week (15)	Application of tumour markers in pathology (breast and lymphoma).

Practical:	
Week (1)	Preparation of solutions and reagents for enzyme histochemistry
Week (2)	demonstration of Hydrolytic enzymes(phosphatase)
Week (3)	Demonstration ofoxidase ad dehydrogenase enzymes
Week (4)	Solutions and reagents preparation of immunohistochemistry
Week (5)	Antigen retrieval by using heating methods (Waterbath)
Week (6)	Antigen retrieval by using heating methods (Steamer)
Week (7)	Antigen retrieval by using heating methods (Autoclave)
Week (8)	Application of enzymatic method for antigen retrieval (Proteinase K)

Week (9)	Immunohistochemistry stain by ABC method
Week (10)	Immunostaining by Polymer base methods
Week (11)	Troubleshooting in immunohistochemistry: demonstration of slides
Week (12)	Differentiation between immunostains expression ; cytoplasmic, nuclear or membranous
Week (13)	Interpretation of immunostains
Week (14)	Epithelial tissue markers and cytokeratin, estrogen receptors
Week (15)	Tutorial

References:

- Buchwalow I.B. Bocker W. (2010). Immunohistochemistry: basics and methods. 2010th edition. London: Springer
- Prasad S.R. (2011). Practical histology for medical students. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Ramos-Vara, JA 2005. "Technical Aspects of Immunohistochemistry".*Vet Pathol 2005;* 42(4): 405–426.
- Suvarna K., Layton C., Bancrofti J.D. (2012). Bancrofti's Theory and practice of histological techniques. 7th edition. London: Churchill Livingstone.

Course title: Research methodology

Course code: RES474

Credit hours: 2(2+0)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course covers the basics of research methodology, and teaches the student how to search literature, state research hypothesis, select study design, calculate sample size, design methodologies, and analyze data. By the end, the student will be capable to write research proposal, thesis and scientific paper.

Course objectives:

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

1. Describe research and various types of health research and the need for health research
2. Develop searching skills
3. Set research hypothesis and research objectives
4. Search literature
5. Describe research methods.
6. Write study area, study population, study variables, and tools of data collection.
7. Recognize sampling methods
8. Calculate sample size
9. Analyze research data
10. Discuss research findings
11. Estimate research budget
12. Establish research schedule
13. Write research proposal
14. Write and cite references
15. Write scientific paper

Instruction methods:

- Lectures
- Tutorials and seminars

- Assignments

Evaluation:

- Theory examination: 80%
- Activities: 20%

Course contents:

Week (1)	Introduction to research
Week (2)	Scientific method and data
Week (3)	Problem selection
Week (4)	Literature review
Week (5)	Objective setting
Week (6)	Study designs (Exploratory)
Week (7)	Study designs (Descriptive and Diagnostic)
Week (8)	Sampling techniques
Week (9)	Data collection Methods (Primary Data & Secondary Data)
Week (10)	Tutorial
Week (11)	Generalization and Interpretation
Week (12)	Proposal writing
Week (13)	Research report writing
Week (14)	Writing scientific paper
Week (15)	Tutorial

❖ **References:**

- Batavia M. (2001). Clinical research for health professionals. 1st edition. Boston: Butterworth-Heinemann.
- Hulley S.B., Cummings S.R., Browner W.S., Girdy D., Hearts N., Newman T.B. (2001). Designing clinical research. 2nd edition. Philadelphia: Lippincott Williams & Wilkins.
- Zeiger M. (2000). Essentials of writing scientific paper. 2nd edition. New York: McGraw Hill.

Course title: Epidemiology and biomedical statistics

Course code: EPD475

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course introduce the students to the epidemiological methods and their applications in order to equip them with the knowledge and skills necessary for epidemiological research, principles of screening, investigation of an outbreak and public health in the global context

Course objectives:

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

1. Define epidemiology as a basic science of preventive medicine and public health practice and Outline the historical evolution of epidemiology
2. Enlist the key features, uses, importance and scope of epidemiology
3. Explain the measurements of disease morbidity and mortality
4. Calculate and interpret morbidity and mortality indicators
5. Discuss the main aspects of epidemiology of communicable diseases
6. Discuss the main aspects of epidemiology of non-communicable diseases
7. Define surveillance and enlist the uses of the surveillance system and describe the surveillance cycle, the characteristics of well-conducted surveillance system and the steps for implementation the surveillance system
8. Describe the practical steps for investigation of an epidemic situation, draw and interpret the epidemic curve
9. Define screening for diseases and describe measures used to evaluate a screening test
10. Calculate and interpret sensitivity, specificity,predictive value of a positive test and predictive value of a negative testfor screening test
11. Discuss Epidemiological studies
12. Describe statistics & its role in modern health science

13. Define variables & describe different types
14. Construct and use a frequency table
15. Construct and use specific graphic representation of data including pie charts, histograms,frequency polygons and box plots.
16. Calculate and interpret summary measures; range, interquartile range, mean, variance, standard deviation, and coefficient of variation.
17. Calculate the confidence interval for a single or for a difference between two summary measures.
18. Perform a significance test to compare various summary measures.
19. Apply a chi-squared test.
20. Explain the distinction between linear correlation and regression.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week(1)	Introduction to Epidemiology
Week(2)	Health Indicators and easurements of disease morbidity and Mortality
Week(3)	Epidemiology communicable and non-communicable diseases
Week(4)	Disease Surveillance, outbreak investigation, and screening for Diseases
Week(5)	Epidemiological studies
Week(6)	Introduction to Biostatistics
Week(7)	Defining and Displaying Data-1
Week(8)	Defining and Displaying Data-2
Week(9)	Measures of central tendency and dispersion

Week(10)	The normal distribution
Week(11)	Confidence interval for a mean/proportion and its interpretation
Week(12)	Comparison of mean- confidence intervals, hypothesis test, and P-values- paired and un-paired data
Week(13)	Analysis of proportions, understanding probability, risk and odds.
Week(14)	Chi-squared Analysis, linear regression and correlation
Week(15)	Sample size calculation

Practical:	
Week(1)	Orientation
Week(2)	Tutorial: Measurements of disease morbidity and Mortality
Week(3)	Tutorial: Disease Surveillance
Week(4)	Tutorial: Outbreak Investigation
Week(5)	Introduction to SPSS
Week(6)	Defining and Displaying Data
Week(7)	Descriptive statistics
Week(8)	Measures of Dispersion
Week(9)	Testing of normality
Week(10)	Comparison of means: • One sample t-test • 2- sample t-test
Week(11)	Comparison of means: • Paired t-test • ANOVA
Week(12)	Probability and risk estimation
Week(13)	Cross tabulation and Chi-squared Analysis
Week(14)	Regression analysis
Week(15)	Correlation analysis

References:

- Armitage P., Berry G., Matthews J.N.S. (2002). Statistical methods in medical research. 4th edition. Massachusetts: Blackwell science.
- Fisher L.D., Belle G.V. (2004). Biostatistics: a methodology for the health sciences. 1st edition. New Jercy: science paperback series.
- Macera C.A., Sfhaffer R.A., Shaffer P.M. (2013). Introduction to epidemiology: distribution and determinants of disease in humans. New York: Delmar, Cengage learning.
- Rastogi V.B. (2015). Biostatistics. 3rd revised edition. New Delhi: Scientific international Pvt Ltd.
- Merrill R.M. (c2013). Introduction to epidemiology. 6th edition. Burlington: Jones & Bartlett learning.

Course title: Advanced molecular biology

Course code: MLB476

Credit hours: 3(2+1)

Intended semester: (7)

Course duration: 15 weeks

Course description:

This course covers the molecular structures of nucleic acids, organization of human genome, regulation of gene expression, and molecular signal transduction; as well as, principles and applications of advanced molecular techniques.

Course objectives:

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

- Discuss concepts and terminologies of advanced molecular biology
- Recognize molecular structures and organization of human genome.
- Discuss different steps of regulation of gene expression in prokaryotes, eukaryotes
- Discuss molecular signal transduction
- Differentiate different methods of qPCR, rtPCR and DNA microarray
- Recognize the concepts of genetic engineering and recombinant DNA technology
- Discuss different methods of gene testing
- Identify the principles and applications of gene therapy
- Discuss molecular basics of cancer biology
- Discuss the applications of molecular biology in forensic medicine
- Extract nucleic acids from different human samples and micro-organisms
- Apply conventional, allele specific, and real-time polymerase chain reaction and polymerase-chain reaction-restriction fragment length polymorphism in diagnostic laboratories

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Concepts of basic molecular biology
Week (2)	Human genome structure: • Nuclear DNA and mitochondrial DNA • Complexity of human genome • Satellites • Transposons, SINE and LINE
Week (3)	Regulation of prokaryotic gene expression: • Environmental adaptation • Activator, repressor, operator and enhancer • Operons • Positive and negative regulation • Lac and Trp Operons
Week (4)	Regulation of eukaryotic gene expression: • Why? • Complexity of gene expression • Complexity of regulation process • Different levels
Week (5)	Molecular signal transduction**:** • Why • Different signals • Different signaling modes • Receptors (Kinases and G-protein binding) • Responses
Week (6)	DNA sequencing**:** • Enzymatic method • Chemical method • Applications

Week (7)	Real time PCR: • Differences between conventional and qPCR • Different method of monitoring the process • Ct and melting curve • Relative and absolute quantification
Week (8)	DNA microarray: • The concept • Different components • Steps • Interpretation • Applications
Week (9)	Recombinant DNA technology**:** • Cloning vectors • Transfection processes • Ligases • Steps • Applications
Week (10)	Gene testing: • When • Target population • Types of gene testing • Specimens collection • Amniocentesis • CVS
Week (11)	Gene therapy: • Why gene therapy • Historical overview • Different delivery tools • Difficulties • Future aspects • Ethics
Week (12)	Cancer biology**:** • Definition • The genetic elements • The environmental elements • Different mechanisms of tumor-genesis • Genes involved
Week (13)	Molecular biology in forensic medicine: • DNA fingerprinting • Paternity testing

	• Capillary electrophoresis and gene typing
Week (14)	Bioinformatics: • Definition and terminologies • Different databases • BLAST • Primer designing
Week (15)	Tutorial

Practical:	
Week(1)	Orientation
Week(2)	DNA extraction from Blood (Phenol-chloroform and Guanidine chloride methods).
Week(3)	DNA extraction from tissues.
Week(4)	Bacterial DNA extraction.
Week(5)	Fungal DNA extraction.
Week(6)	Determination of DNA concentration and purity
Week(7)	Pre- PCR Gel-electrophoresis.
Week(8)	Principle of PCR and Primer design.
Week(9)	Master Mix calculations, PCR optimization and Run.
Week(10)	Post – PCR electrophoresis and trouble shooting.
Week(11)	Multiplex and RAPD PCR
Week(12)	Real time and Reverse Transcriptase PCR.
Week(13)	Allele specific PCR and RFLP
Week(14)	Nested PCR.
Week(15)	DNA sequencing.

References:

- Champe P.C., Harvey R.A., Ferrier D.R. (2005). Biochemistry. 3rd edition. USA: Lippincott Williams & Wilkins.
- Craig N.L., Cohen-Fix O., Green R. Greider C.W., Storz G. Wolberger C. (2010). Molecular biology: principles of genome function. Oxford: Oxford University press.

- Elliot W.H, Elliot D.C. (2006). Biochemistry and molecular biology. 3rd edition. New York: Oxford University press.

SEMSTER EIGHT

Course title: Advanced chemical pathology (2)

Course code: CLN481

Credit hours: 4(2+2)

Intended semester: (8)

Course description:

This course covers neonatal and pediatric biochemistry, obstetric and age-related biochemistry, Inherited metabolic disorders, biochemical aspects of nutrition, obesity, clinical chemistry of pregnancy, vitamins, trace elements and their toxicology, tumor markers, haematological biochemistry, porphyrias, therapeutic drugs monitoring, Molecular Diagnosis of the diseases and Clinical chemistry of acquired immunodeficiency syndrome (AIDS).

Course objectives:

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

1. Recognize inherited metabolic disorders
2. Define trace elements and apply methods of trace elements measurement
3. Define tumor markers and identify their uses
4. Numerate vitamins and discuss their clinical significance
5. Discuss aspects of clinical chemistry of pediatrics and pregnancy
6. Discuss haematological aspects of clinical chemistry
7. Discuss importance of drug monitoring and methods uses for this purpose
8. Describe molecular methods applied for diagnosis of disorders related to chemical pathology.
9. Describe chemical pathology changes related to AIDS.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%

- Activities 20%

Course contents:

Week (1)	Introduction
Week (2)	Nutritional assessments
Week (3)	Clinical significance of vitamins
Week (4)	Tumor markers-1
Week (5)	Tumor markers-2
Week (6)	Obesity
Week (7)	Clinical chemistry of pediatrics
Week (8)	Clinical Chemistry of Pregnancy
Week (9)	Hematological aspects in clinical chemistry
Week (10)	Porphyrins metabolism & disorders
Week (11)	Clinical chemistry of extreme age
Week (12)	Molecular Diagnosis of the diseases-1
Week (13)	Molecular Diagnosis of the diseases-2
Week (14)	Clinical chemistry of AIDS
Week (15)	Tutorial

Practical:	
Week (1)	Inborn error of metabolism case studies: Ammonia disorders, Glycogen storage disease and Glactosemia.
Week (2)	Estimation of Zink and Iron
Week (3)	Nutritional assessments
Week (4)	Vitamins disorder
Week (5)	Estimation of ACP and Alpha fetoprotein

Week (6)	Assessment of obesity problems.
Week (7)	Assessment of pediatrics abnormal parameters.
Week (8)	assessment of pregnancy abnormal parameters
Week (9)	Estimation of Iron binding globulin.
Week (10)	Estimation of Porphyries
Week (11)	Extremes of age abnormal parameter case studies.
Week (12)	Aspirin estimation and its toxicity assessment
Week (13)	Molecular analysis of chemical pathological conditions
Week (14)	AIDs and abnormal parameters in clinical chemistry.
Week (15)	Tutorial.

References:

- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.
- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Selected topics in clinical chemistry

Course code: CLN482

Credit hours: 3(2+1)

Intended semester: (8)

Course duration: 15 weeks

Course description:

This course covers advanced analytical techniques used in clinical chemistry, therapeutic drug monitoring, inborn errors of metabolism, metabolic syndromes, trace elements, and lipid profile and cardiovascular disorders.

Course objectives:

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

1. Discuss principle, operation, and uses automated clinical analyzers, as well as electrophoresis, chromatography, and immunoassays.
2. Describe methods of drug monitoring and discuss their importance and applications
3. Numerate inborn errors of metabolism, their clinical consequences and methods of diagnosis
4. Define metabolic syndromes and discuss their pathogenesis, clinical presentation, and laboratory diagnosis
5. Numerate trace elements and discuss their clinical importance
6. Discuss role of lipids in pathogenesis of cardiovascular diseases

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities 20%

Course contents:

Week (1)	Introduction
Week (2)	Automation in clinical chemistry-1
Week (3)	Automation in clinical chemistry-2
Week (4)	Electrophoresis-1
Week (5)	Electrophoresis-2
Week (6)	Chromatography-1
Week (7)	Chromatography-2
Week (8)	Immunoassays-1
Week (9)	Immunoassays-2
Week (10)	Therapy drug monitoring
Week (11)	Inborn errors of metabolism
Week (12)	Metabolic syndromes
Week (13)	Trace elements
Week (14)	Lipids and cardiovascular disorders-1
Week (15)	Lipids and cardiovascular disorders-2

Practical:	
Week (1)	Orientation
Week (2)	Automated clinical chemistry analyzer-1
Week (3)	Automated clinical chemistry analyzer-2
Week (4)	Electrophoresis-1
Week (5)	Electrophoresis-2
Week (6)	Chromatography-1
Week (7)	Chromatography-2
Week (8)	Enzyme linked immunoassay (ELISA)
Week (9)	Radio-immunoassay (RIA)
Week (10)	Tutorial
Week (11)	Case study: Drug monitoring
Week (12)	Case study: Inborn errors of metabolism
Week (13)	Case study: Metabolic syndromes

Week (14)	Case study: Trace elements
Week (15)	Case study: Lipids and cardiovascular disorders

References:

- Crook M.A. (2006). ZILVA clinical chemistry and metabolic medicine. 7th edition. London: Hodder Arnold.
- Marshall W.J., Bangert S.K. (2008). Clinical chemistry. 6th edition. Philadelphia: Elsevier Ltd.
- Marshall W.J., Lapsley M., Day A.P., Ayling R.M. (2014). Clinical biochemistry: metabolic and clinical aspects. 3rd edition. Philadelphia: Churchill Livingstone

Course title: Advanced Diagnostic Microbiology

Course code: MCR481

Intended semester: (8)

Credit hours: 4(2+2)

Course duration: 15 weeks

Course description:
This course covers advanced diagnostic techniques in microbiology, this course gives the student information about automation in microbiology, molecular diagnostic methods used in diagnosis of microbial infections, advanced microbial typing and profile-based microbial identification systems, beside antimicrobial methods, drug resistance, and nasocomial infections.

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

1. Identify of the basic concepts of microbiology automation.
2. Explain standard use of laboratory equipment.
3. Recognize the principles of molecular diagnostic methods.
4. Practice advanced methods in microbial typing.
5. Discuss pathogenesis and epidemiology of nosocomial infections.
6. Perform different methods of antimicrobial susceptibility testing.

Instruction methods:

- Lectures
- Practical
- Tutorials

Evaluation:

- Theory examination: 40%
- Practical: 40%
- Activities: 20%

Course contents:

Week (1)	Automation in microbiology laboratory
Week (2)	Molecular diagnostic tests in the microbiology laboratory (I)
Week (3)	Molecular diagnostic tests in the microbiology laboratory (2)
Week (4)	Advanced biochemical profile-based microbial identification systems.
Week (5)	Tutorial
Week (6)	Bacterial typing.
Week (7)	Phenotypic testing of bacterial antimicrobial susceptibility.
Week (8)	Detection of specific antimicrobial resistance mechanisms in Staphylococci
Week (9)	Detection of specific antimicrobial resistance mechanisms in Streptococci, Haemophilus Neisseria and Moraxella.
Week (10)	Detection of specific antimicrobial resistance mechanisms in

	Enterobacteriaceae (I)
Week (11)	Detection of specific antimicrobial resistance mechanisms in Enterobacteriaceae (II)
Week (12)	Advances in the diagnosis of Mycobacterium tuberculosis and detection of drug resistance
Week (13)	Flow-cytometric assays in diagnostic microbiology
Week (14)	Vaccines and vaccine design
Week (15)	Transplantation techniques

Practical:	
Week (1)	Demonstration of different microbiology lab automation
Week (2)	Bacterial nucleic acid extraction1
Week (3)	Bacterial nucleic acid extraction 2
Week (4)	API and other automations
Week (5)	PCR
Week (6)	Agarose gel electrophoresis
Week (7)	Agar diffusion antimicrobial sensitivity test.
Week (8)	E-Test susceptibility test
Week (9)	Dilution Methods for antimicrobial sensitivity test.
Week (10)	Restriction Fragment Length Polymorphism (RFLP).
Week (11)	PCR for MRSA and VRSA resistance gene.
Week (12)	Audiovisual demonstration (Sequencing and data analysis)
Week (13)	Audiovisual demonstration (Flow-cytometric assays in diagnostic microbiology)
Week (14)	Diagnosis of M. tuberculosis and detection of drug resistance.
Week (15)	Tutorial

References:

1. Cheesbrough, M. Distinct Laboratory Manual IN tropical countries. (2008). Revised 2nd edition. Cambridge: Cambridge University press.
2. Collee J. G., Marmion B. P., Fraser A. G.; Simmons A. (2007). Mackie and McCarteny Practical Medical Microbiology. 14th edition. New York: Elsevier science.
3. Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Course title: Advanced medical virology

Course code: MCR482

Intended semester: (8)

Credit hours: 3(2+1)

Course duration: 15 weeks

Course description:

This course provides the student with detailed information about general properties and replication of viruses, it covers the properties, classification, pathogenesis, mode of transmission, and epidemiology of medically important viruses. It also covers laboratory diagnosis of viral infections and immunity to viral infection.

Course objectives:

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

7. Identify general properties of viruses.
8. Describe morphology, classification & replicative cycle of viruses.
9. Practice how to collect, transport and store clinical specimens, and how to recognize the infecting viruses in this specimen.
10. Discuss pathogenesis, epidemiology & immunity in viral infection.
11. Recognize different properties, classification, mode of transmission, pathogenesis and control of medical important viruses
12. Perform different methods applied in laboratory diagnosis of viral infections (tissues culture & serological test).

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction: General properties structure and classification of viruses.
Week (2)	Pathogenesis of medical viruses and viral replication.
Week (3)	Laboratory diagnosis strategies of viral infection: Collection, transport, and storage of of viral specimens.
Week (4)	Cell culture techniques**:** Types, components, preparation, inoculation and examination
Week (5)	Viral serological tests: ELISA, EIA and Fluorescent techniques.
Week (6)	Viral serological tests: CFT, Neutralization test and Haemoagglutination inhibition test
Week (7)	Arthropod-borne virus: Yellow fever and Dengue fever viruses
Week (8)	Influenza viruses and SARS.
Week (9)	Paramyxoviruses: Rubella, Measles and Mumps viruses
Week (10)	Enteroviruses: Polioviruses and Rotaviruses
Week (11)	Rabies virus
Week (12)	Hepatitis viruses
Week (13)	HIV virus
Week (14)	Reoviruses and Coronaviruses
Week (15)	Herpes simplex viruses, Cytomegaloviruses and EBV

Practical:	
Week (1)	Audio-visual demonstration- structures of viruses
Week (2)	Tutorial: Early history of medical viruses
Week (3)	Audio-visual demonstration- viral replication and pathogenesis
Week (4)	Collection, transport and storage of viral specimens
Week (5)	Equipments for tissue culture techniques
Week (6)	Preparation of cells lines
Week (7)	Propagation of cells lines
Week (8)	Viral identification- detection by CPE
Week (9)	Operation and types of solid phase
Week (10)	EIA: coating of Ags or Abs
Week (11)	Detection of infected cells by IFA

Week (12)	Haemagglutination serological tests
Week (13)	Laboratory diagnosis of dengue fever rubella and poliomyelitis
Week (14)	Serological diagnosis of viral hepatitis
Week (15)	Laboratory diagnosis of HIV

References:

- Dimmock N.J., Easton A.J., Leppard K.N. (2001). Introduction to modern virology. 5th edition. London: Blackwell science.
- Shorts T. (2013). Understanding viruses. 2nd edition. Burlington: Jones and Bartlett learning.
- Wanger E.K. Hewlett M.J. (1999). Basic virology. 1st edition. Massachusetts: Blackwell publishing.

Course title: Diagnostic parasitology

Course code: PARA481

Credit hours: 2(2+2)

Intended semester: (8)

Course duration: 15 weeks

Course description:
This course provides the student with comprehensive information about laboratory diagnosis of human parasitic diseases.

Course o**bjectives:**

1. Demonstrate adequate knowledge about principles and techniques of the parasitological methods that are applied in the diagnosis of different parasitic infections.
2. Practice parasitological and relevant techniques that are applied in the diagnosis of parasitic infections.
3. Demonstrate adequate knowledge about the principals and to practice parasitological techniques that are applied in the diagnosis of Malaria, Leishmaniasis, Trypanosomiasis, and toxoplasmosis.
4. Discuss the principals and to practice the parasitological techniques applied in the diagnosis of intestinal protozoa infections, intestinal worms and blood and tissue worms.

Instruction methods:

- Lectures
- Practical
- Tutorials and Assignments
- Seminars

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Quality control in parasitology laboratory

Week (2)	Laboratory diagnosis of malaria – I
Week (3)	Laboratory diagnosis of Malaria –II
Week (4)	Laboratory diagnosis of Leishmaniasis
Week (5)	Laboratory diagnosis of coccidian parasites
Week (6)	Laboratory diagnosis of Entamoebaspp
Week (7)	Laboratory diagnosis of intestinal flagellates
Week (8)	Laboratory diagnosis of intestinal Nematodes
Week (9)	Laboratory diagnosis of tissue Nematodes-I: Filariasis
Week (10)	Laboratory diagnosis of tissue Nematodes –II : Onchocercasis and Quinea worm
Week (11)	Laboratory diagnosis of Cestodes-I: Taenia spp
Week (12)	Laboratory diagnosis of Cestodes- II: Hydatid disease
Week (13)	Laboratory diagnosis of intestinal fluke
Week (14)	Laboratory diagnosis of Schistosomiasis
Week (15	Tutorial

Practical:

Week (1)	Orientation
Week (2)	P. falciparum and P. vivax diagnosis: Detection, identification, and parasite load
Week (3)	P. ovalae and P. malariae: Detection, identification, and parasite load
Week (4)	Diagnosis of Leishmania
Week (5)	Diagnosis of coccidian diarrhea
Week (6)	Diagnosis of intestinal protozoa-I
Week (7)	Diagnosis of intestinal protozoa II
Week (8)	Diagnosis of intestinal worms Cultural methods and other special techniques

Week (9)	Diagnosis of filarial worms I
Week (10)	Diagnosis of filarial worms II
Week (11)	Diagnosis Taeni aspp and hydatid cyst
Week (12)	Intestinal and liver flukes
Week (13)	Diagnosis of Schistomiasis-1
Week (14)	Diagnosis of Schistomiasis-2

References

- Gracia L.S. (2007). Diagnostic medical parasitology. 5th edition. Washington: ASM Press.
- Gracia L.S. (2009). Practical guide to diagnostic parasitology. 2nd edition. Washington: ASM Press.
- Zeibig E. (2013). Clinical Parasitology. 2nd edition. Canada: Elsevier.

Course title: Immuno- andmolecular parasitology

Course code: PARA482

Credit hours: 3(2+1)

Intended semester: (8)

Course duration: 15 weeks

Course description:
This course provides the students with intensive information about the immunological events during parasitic invasion and principles and applications of immunological and molecular biology techniques applied for diagnosis of parasitic diseases.

Course objectives:

1. Demonstrate adequate knowledge about the pathogenicity, pathological bases of parasitic infections
2. Practice and demonstrate basic and advanced parasitological techniques
3. Applied in the diagnosis of parasitic infections, including in vitro and in vivo cultivation of parasites.
4. Discuss the epidemiology of important parasites in Sudan.
5. Describe immune response to parasitic infections, and the bases of implementation of immunological methods in the diagnosis of parasitic infections.
6. Recognize the molecular biology of parasites and uses of molecular biology techniques in diagnosis of parasitic infections.

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Oral examination: 20%

Course contents:

Week (1)	Malaria I: pathology and pathogenicity
Week (2)	Malaria II: Epidemiology and chemotherapy.
Week (3)	Visceral Leishmaniasis

Week (4)	Trypanosomiasis
Week (5)	Toxoplasmosis Coccidian diarrhea
Week (6)	Schistosomiasis
Week (7)	Intestinal worms
Week (8)	Onshocercasis
Week (9)	Immunological events during parasitic invasion
Week (10)	Principles of immunological techniques
Week (11)	Immunity to malaria
Week (12)	Immunity to Leishmania - Immunity to Trypanosoma
Week (13)	Immunity to intestinal parasites
Week (14)	Introduction to molecular Biology
Week (15)	Bases of molecular biology techniques in the diagnosis of parasitic infections

Practical:

Week (1)	Parasitological and other relevant findings in malaria-I
Week (2)	Parasitological and other relevant findings in malaria-II
Week (3)	Histlogical and cytological findings in Leishmaniasis
Week (4)	Diagnosis of Trypanosomiasis
Week (5)	Diagnosis of Toxoplasmosis and coccidian diarrhea
Week (6)	Histological other findings in Schistosomiasis
Week (7)	Parasitological and other relevant findings in Intestinal worms infection
Week (8)	Diagnosis of Onshocercasis
Week (9)	Instrumentation in immunology and molecular biology laboratory
Week (10)	Immunological techainques
Week (11)	Immuno- diagnosis of malaria
Week (12)	Immuno- diagnosis of Leishmaniasis
Week (13)	Immuno- diagnosis of intestinal parasites
Week (14)	Molecular biology techniques (DNA extraction, PCR)
Week (15)	Molecular biology techniques (RFLP, DNA sequencing**)**

References

- Gracia L.S. (2007). Diagnostic medical parasitology. 5th edition. Washington: ASM Press.
- Gracia L.S. (2009). Practical guide to diagnostic parasitology. 2nd edition. Washington: ASM Press.
- Zeibig E. (2013). Clinical Parasitology. 2nd edition. Canada: Elsevier.

Course title: White blood cell disorders

Course code: HEM481

Credit hours: 4(2+2)

Intended semester: (8)

Course duration: 15 weeks

Course description:
This course covers the definition, classification, aetiology, pathogenesis, clinical features, and laboratory diagnosis of benign and malignant white blood cell disorders, including leucocytosis, leucopenia, functional and morphological disorders, leukaemia, and lymphoma.

Course o**bjectives:**

1. Describe the characteristics of normal white blood cells in normal circulating blood and bone marrow.
2. Describe the functions of white blood cells and the maturity differentiation.
3. Identify the abnormalities of white blood cells morphology and function.
4. Discuss the etiology, morphology of cells, related symptoms, and laboratory findings of the different benign quantitative and qualitative leukocyte disorders.
5. Perform the differential leukocyte count and calculate absolute count of white blood cells by using manual procedures.
6. Correct total white blood cell count when nucleated red blood cells are present.
7. Identify normal and abnormal white blood cells and white blood cell precursors in peripheral blood picture.
8. Describe and identify different leukopoietic stages.
9. Define leukaemia and discuss its classification, pathopysiology, clinical features and laboratory diagnosis.
10. Describe the morphological features of different acute and chronic leukaemias.
11. Discuss French-American- Britich (FAB) and World Health organization (WHO) classification of acute leukaemias
12. Understand the principle of/ and perform different cytochemical stain for differential diagnosis of acute leukaemias.
13. Define immunophenotyping and discuss its role in diagnosis of haematological malignancies.
14. Define chronic myelocyticleukaemia and describe its classification, pathophysiology, clinical features and laboratory diagnosis.
15. Identify Philadelphia chromosome and BCR-APL fusion gene and describe the methods applied for their detection.
16. Define chronic lymphocytic leukaemia and describe its classification, pathophysiology, clinical features and laboratory diagnosis.
17. Numerate different T-chronic lymphocytic leukaemia and B-chronic lymphocytic leukaemia variants and describe their morphological features.

18. Define myelofibrosis and describe its pathophysiology, clinical features and laboratory diagnosis.
19. Define myelodysplastic syndrome and describe its classification, pathophysiology, clinical features and laboratory diagnosis.
20. Define lymphoma and describe its classification, pathophysiology, clinical features and laboratory diagnosis.
21. Discuss the principle of flowcytometry and their applications in haematology
22. Numerate cytogenetic abnormalities associated with different types of haematological abnormalities and describe their association with the disease prognosis and their roles in diagnosis of different haematological malignancies.

Instruction methods

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	**Introduction:** • Leucopoiesis • Leucocyte function and kinetic • Normal morphology of leucocytes
Week (2)	**Benign quantitative leucocyte disorders :** • Leucocytosis • Leucopenia
Week (3)	**Benign qualitative leucocyte disorders :** • Hereditary abnormalities of leucocyte function and morphology • Acquired abnormalities of leucocyte function
Week (4)	**Introduction to leukaemia:** • Definition • Classification • Causes • Leukaemogenesis • Clinical features • Laboratory diagnosis

Week (5)	**Acute myeloblastic leukaemia (AML):** • Definition • Classification • Pathophysiology and clinical features • Laboratory diagnosis • Treatment
Week (6)	**Acute lymphoblastic leukaemia (ALL):** • Definition • Classification • Pathophysiology and clinical features • Laboratory features • Treatment
Week (7)	**Chronic myeloid leukaemia (CML): Philadelphia positive CML** • Definition • Association with ph' chromosome • Pathophysiology and clinical feature • Clinical course • Laboratory diagnosis • Treatment
Week (8)	**Chronic myeloid leukaemias:** • Philadelphia negative CML • Juvenile CML • Chronic myelomonocytic leukaemia (CMML) • Other variants
Week (9)	**Chronic lymphocytic leukaemia (CLL):** • Definition • Pathophysiology and clinical feature • Staging • Laboratory diagnosis • Treatment
Week (10)	**B-CLL variants:** • B-prolymphocyticleukaemia (B-PLL) • Hairy cell leukaemia (HCL) • Plasma cell leukaemia (PCL)
Week (11)	**T-CLL variants:** • T-prolymphocyticleukaemia • Large granular lymphocytic leukaemia (LGL) • Sezary syndrome • Adult T-cell leukaemia lymphoma (ATLL)

Week (12)	**Multiple myeloma and related disorders**
	• Paraproteinaemia
	  • Multiple myeloma
	  • Waldenstrom'smacroglobulinaemia
	  • Heavy chain disease

Week (13)	**Myelodysplastic syndrome (MDS):** • Definition • Causes • Classification • Pathophysiology and clinical features • Laboratory diagnosis • Treatment
Week (14)	**Myelofibrosis:** • Definition • Causes • Pathophysiology and clinical features • Laboratory diagnosis • Treatment
Week (15)	**Lymphoma:** • Definition • Classification • Pathophysiology and clinical features • Laboratory diagnosis • Complications • Treatment

Practical:

Week (1): Differential white blood cell count (normal sample)
Week (2): Calculation of absolute leucocyte counts
Week (3): Correction of total white blood cell count
Week (4): Identification of immature leucocytes
Week (5): Morphological abnormalities of leucocytes
Week (6): Morphological features of acute myeloblastic leukaemia(AML)
Week (7): Morphological features of acute lymphoblastic leukaemia(ALL)
Week (8): Cytochemical stain: SBB
Week (9): Cytochemical stain: PAS
Week (10): Morphological features of chronic myeloid leukaemia "chronic phase"
Week (11): Morphological features of chronic myeloid leukaemia "accelerated and acute phase"

Week (12): Morphological features of chronic lymphocytic leukaemia “classic CLL”
Week (13): Morphological features of chronic lymphocytic leukaemia variants
Week (14): Morphological features of Myelofibrosis
Week (15): Morphological features of myelodysplastic syndrome

References:

1. Bain B.J. (2003). Leukaemia diagnosis. 3rd edition. Massachusetts: Blackwell publishing Ltd
2. Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
3. Hoffbrand A.V., Moss P.H.A., Pettit J.E. (2006). Essential Haematology. 5th edition. Massachusetts: Blackwell publishing Ltd.
2. Steine-Martin E.A., Lotspeich-Steininger C.A., Koepke J.A. (1998). Clinical Haematology: principles, procedures, correlation. 2nd edition. Philadelphia: Lippincott-Raven publishers.

Course title: Haemostatic disorders

Course code: HAEM482

Credit hours: 3(2+1)

Intended semester: (8)

Course duration: 15 weeks

Course description:

This course covers the normal haemostatic mechanisms, haemostatic disorders, and laboratory investigations used for diagnosis of haemostatic disorders.

Course objectives:

1. Define haemostasis and describe their functions and components.
2. Describe megakaryocytic development & define the term endoreduplication.
3. Numerate the functions of thrombopoietin.
4. Describe the process of platelet formation from a megakaryocyte.
5. Discuss the ultra structural components and cytoplasmic constituents of a mature platelet & describe the overall function of each.
6. Describe blood vessel structure and discuss their roles in normal haemostasis.
7. Describe the life span activities of a mature platelet and function of platelets in response to vascular damage.
8. Numerate the substances that promote & the substances that inhibit some aspect of platelet aggregation.
9. Briefly describe the process of platelet plug consolidation & stabilization.
10. Identify the coagulation factors nomenclature and list the principal coagulation factors.
11. Name the three groups of coagulation factors and describe their similarities.
12. Describe the individual functional characteristics of each of the coagulation factors.
13. Describe the sequence of events in the extrinsic, intrinsic and common coagulation pathways.
14. Numerate the naturally occurring inhibitors of coagulation and describe their roles in regulation of blood coagulation.
15. Describe the components of the fibrinolytic system,
16. Numerate plasminogen activators and inhibitors and describe their actions
17. Define the term purpura & describe various vascular conditions that can produce this condition.
18. Name and compare types of disorders in which abnormal platelet morphology can be observed.
19. Mention symptoms of thrombocytopenia and list the major mechanisms that produce thrombocytopenia.
20. Summarize the major characteristics of each of the three of thrombocytopenic categories, including examples of disorders within each of the categories or subcategories.
21. List the characteristics of the two categories of thrombocytosis, including examples of disorders within each category.
22. Comparing the main categories of platelets dysfunction, including examples of disorders within each category.
23. Define disseminated intravascular coagulation and the list triggering events that may predispose patients to disseminated intravascular coagulation.

24. Describe the pathophysiology and clinical features of disseminated intravascular coagulation
25. Name and describe the factors that contribute to the pathological inhibition of coagulation.
26. Define the term hypercoagulability.
27. Describe the hereditary and acquired causes of hypercoagulability.
28. Describe the activity of blood coagulation factors in increasing the tendency toward thrombosis.
29. Prepare platelet poor- and platelet rich-plasma
30. Discuss the principles of/ and perform laboratory tests used for diagnosis of haemostatic disorders by manual and automated methods.
31. Discuss the principles of coagulometry

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities: 20%

Course contents:

Week (1)	Introduction to haemostasis: • Definition • Components • Functions • Primary and secondary haemostasis
Week (2)	Normal haemostatic mechanism- Role of blood vessels: • Types of blood vessel • Structure of blood vessels • Role of blood vessel in normal haemostasis
Week (3)	Normal haemostatic mechanism- platelets: • Platelet production • Platelet structure • Role of platelets in normal haemostasis
Week (4)	Normal haemostatic mechanism- coagulation system: • Coagulation factors • Coagulation cascade

	• Regulation of coagulation
Week (5)	Normal haemostatic mechanism- fibrinolytic system: • Plasminogen • Plasminogen activators • Fibrinolysis • Fibrinogen/fibrin degradation products (FDPs) • Regulation of fibrinolytic system
Week (6)	Screening of haemostatic abnormalities: • Bleeding time (BT) • Clotting time • Clot retraction
Week (7)	First-line investigations of coagulation: • Prothrombin time (PT) • International normalized ratio (INR) • Activated partial thromboplastin time (APTT) • Thrombin time (TT) • Fibrinogen estimation • Interpretation of first-line investigation results
Week (8)	Second-line investigations of coagulations: • Correction of prolonged APTT • Correction of prolonged PT and APTT • Correction of prolonged TT
Week (9)	Quantitative platelet disorders: • Thrombocytosis • Thrombocytopenia
Week (10)	Qualitative platelet disorders: • Congenital disorders of platelet function • Acquired disorders of platelet function
Week (11)	Haemophilia: • Haemophilia A • Haemophilia B • Haemophilia C
Week (12)	Von- Willebrand disease: • Definition • Inheritance • Classification • Pathophysiology and clinical features • Laboratory findings

Week (13)	Hypercoagulability: • Definition • Causes • Pathophysiology • Clinical features • Laboratory diagnosis
Week (14)	Disseminated intravascular coagulation (DIC): • Definition • Causes • Pathophysiology and clinical features • Laboratory diagnosis
Week (15)	Coagulometry: • Principles • Advances • Advantages • Disadvantages

Practical	
Week (1)	Introduction
Week (2)	Preparation of platelet poor plasma and platelet rich plasma
Week (3)	Platelet count: different methods
Week (4)	Platelet aggregation test
Week (5)	Euglobulin lysis time
Week (6)	Bleeding time
Week (7)	Clotting time and clot retraction test
Week (8)	Prothrombin time (PT)
Week (9)	Activation partial thromboplastin time (APTT)
Week (10)	Thrombin time (TT)
Week (11)	Fibrinogen assay: Clause method
Week (12)	Correction test with normal plasma (inhibitor screening)
Week (13)	Correction of prolonged PT and APTT
Week (14)	Correction of prolonged TT
Week (15)	Quality assurance in practical haemostais

❖ References

- Bain B.J., Bates I., Laffan M.A. (2016). Dacie and Lewis practical Haematology, 12th edition. Philadelphia: Elsevier limited.
- Hoffbrand A.V., Moss P.H.A., Pettit J.E. (2006). Essential Haematology. 5th edition. Massachusetts: Blackwell publishing Ltd.

- Steine-Martin E.A., Lotspeich-Steininger C.A., Koepke J.A. (1998). Clinical Haematology: principles, procedures, correlation. 2nd edition. Philadelphia: Lippincott-Raven publishers.

Course title: Cytogenetics and Tumor Pathology

Course code: HST481

Credit hours: 4(2+2)

Intended semester: (8)

Course duration: 15 weeks

Course description:
This course deals with the study of chromosomes and the cytogenetic explanation of different genetic diseases. It also involves descriptions of primary organs and grading of tumors within the CNS, genitourinary, GI, reproductive, respiratory, endocrine, skin, muscular and skeletal regions are presented detailing the pathological aspect of the cells and tissues. Tumor pathology including epidemiology, etiology, signs/symptoms, cell types, predisposing factors and metastatic pathways of specific sites.

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

1. Discuss the principles, uses, and techniques of cytogenetics.
2. Perform the techniques used in cytogenetic laboratory.
3. Discuss the tumor pathogenesis
4. Explain the organization and complexity of human genome at the Cytogenetic Level
5. Explain the nature of chromosomal abnormalities in clinical syndromes associated with cytogenetic disorders
6. Explain the nature of chromosomal abnormalities in the disorders of sexual differentiationEvaluate appropriately the family pedigree and the population and ethnic aspects of inherited disorders
7. Define the principles, procedures, and precautions of advanced Clinical genetics techniques.
8. Perform tissue culture and chromosomal analysis.
9. Define the nomenclature of tumors, etiology ,clinical affect, staging and lab diagnosis of tumor with focusing on certain types

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Oral examination: 20%

Course contents:

Week (1)	Introduction to human cytogenetic and ethical consideration in human cytogenetic practices.

Week (2)	The structure and function of the human chromosomes, and dry lab 1 (culture media, buffers, solution, and stains).
Week (3)	Dry lab 2 (Tissue culture and chromosome preparation), and Culturing peripheral blood and bone marrow.
Week (4)	Culturing human tissue, and solid tumors
Week (5)	Constitutional chromosomal changes, and chromosome aberrations in hematological malignancy (Leukemia).
Week (6)	Chromosome aberrations in hematological malignancy (Lymphoma), and the cytogenetic of bone and soft tissue tumors.
Week (7)	The cytogenetic of solid tumors, and human chromosome nomenclature (ISCN).
Week (8)	Fluorescent in situ hybridization (FISH) technique, and bioinformatics from a cytogenetic perspective.
Week (9)	Introduction to Neoplasia, and tumour nomenclature.
Week (10)	Cell Biology of tumors, and tumor Etiology.
Week (11)	Oncogenesis, staging and grading of cancer.
Week (12)	Clinical Effects of tumors and laboratory Diagnosis of Tumors.
Week (13)	Tutorial
Week (14)	Breast Masses, and tumors of female Genitalia.
Week (15)	Tumors of Testis, Prostate, GIT Tumors, and urothelial Tumors.

Practical-2:	
Week (1)	Orientation
Week (2)	Cutting of chromosomes: Normal and abnormal karyotypes.
	Cutting of chromosomes: Abnormal karyotypes.
Week (3)	Preparation of media, buffers, and solutions for peripheral blood culture
	Blood culture.
Week (4)	Harvesting of blood culture and slide preparation
	Slide staining and chromosomal analysis.

Week (5)	Slide analysis using Cytovision station.
	Bone marrow culture
Week (6)	Harvesting of bone marrow culture and slide preparation
	Slide staining and chromosomal analysis.
Week (7)	Culturing of solid tumor.
	Harvesting of the solid tumor culture and slide preparation
Week (8)	Slide preparation for FISH analysis
	Analysis of FISH slide using fluorescent microscopy
Week (9)	Overview of normal histology: GIT.
	Overview of normal histology: respiratory and urinary system
Week (10)	Overview of normal histology: skin and lymphoid system
	Overview of normal histology: reproductive system (male and female).
Week (11)	Cytological appearance of benign cell of epithelial origin (gynecological cytology) and hormonal influence
	Cytological appearance of benign cell of non-epithelial origin
Week (12)	Inflammation in gynecological cytology
	Pre-malignancy and malignancy in gynecological cytology
Week (13)	Non gynecological cytology (respiratory, urinary, and GIT)
	laboratory investigations of genetic disorders and the lymphoreticular system
Week (14)	Breast tumors
	Gastrointestinal tumors, urothelial and prostate tumors
Week (15)	liver, biliary tract and pancreas tumours
	Female reproductive system (ovarian and fallopian tube tumors) and male reproductive system tumours

References:

- Garg R.G., Gupta S. (2011). Review of pathology and genetics. 3rd edition. New Delh: Jypee brothers medical publisher (P) Ltd.
- Kierszenbaum A.L. (2007). Histology and cell biology: an introduction to pathology. 2nd

edition. Philadelphia: Elsevier limited.
- Ram M. (2010). Fundamentals of cytogenetics and genetics. 1st edition. Eastern economy edition. New Delhi: PHI learning private limited.

Course title: Selected Topics in Histopathology

Course code: HST482

Credit hours: 2(2+0)

Intended semester: (8)

Course duration: 15 weeks

Course description:

This course is designed to provide the students an opportunity to experience certain aspects in anatomical/histological and cell biological sciences.

GENERAL OBJECTIVES:

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

Understand and discuss an advanced topicsin the field of histopathology, in addition to an important basic topics that are not covered in other courses offered by the department.

SPECIFIC OBJECTIVES:

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

1. Grossing and dissection of surgical pathology specimens.
2. Tissue microarray in pathology.
3. Techniques in Neuropathology.
4. Neuroendocrine system and cytoplasmic granules.
5. Immunocytology.
6. Digital image analysis and virtual microscopy in pathology.
7. Flow cytometry.
8. Troubleshoots in tissue processing.
9. Techniques for analyzing mineralized bone and their application.
10. Human papilloma virus.
11. Fluorescence and confocal microscopes basic principles and applications in pathology
12. Electron microscopy: principle, components, optics and specimen processing.
13. Quality control and laboratory organization.
14. Laboratory safety and laboratory waste disposal.

Lecture Titles:

Week 1 Grossing and dissection of surgical pathology specimens

Week 2 Tissue microarray in pathology

Week 3 Techniques in Neuropathology

Week 4 Neuroendocrine system and cytoplasmic granules

Week 5 Immunocytology

Week 6 Digital image analysis and virtual microscopy in pathology: history, scanning the slide, viewing virtual slide, capturing images for image analysis, image analysis, applications of image analysis in pathology

Week 7 Flow cytometry: basic principles, procedure and applications in pathology

Week 8 Mid term

Week 9 Troubleshoots in tissue processing

Week 10 Techniques for analyzing mineralized bone and their application

Week 11 Human papilloma virus

Week 12 Fluorescence and confocal microscopes basic principles and applications in pathology

Week 13 Electron microscopy: principle, components, optics and specimen processing.

Week 14 Quality control and laboratory organization

Week 15 Laboratory safety and laboratory waste disposal

Practical contents:

Week 1 Grossing and dissection of surgical pathology specimens

Week 2 Tissue microarray in pathology

Week 3 Techniques in Neuropathology

Week 4 Neuroendocrine system and cytoplasmic granules

Week 5 Immunocytology

Week 6 Digital image analysis and virtual microscopy in pathology: history, scanning the slide, viewing virtual slide, capturing images for image analysis, image analysis, applications of image analysis in pathology

Week 7 Flow cytometry: basic principles, procedure and applications in pathology

Week 8 Mid term

Week 9 Troubleshoots in tissue processing

Week 10 Techniques for analyzing mineralized bone and their application

Week 11 Laboratory diagnosis of HPV

Week 12 Fluorescence and confocal microscopes basic principles and applications in pathology

Week 13 Electron microscopy: principle, components, optics and specimen processing.

Week 14 Quality control and laboratory organization

Week 15 Laboratory safety and laboratory waste disposal

Instruction methods:

- Lectures
- Practical
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination 40%
- Oral examination: 20%

References:

- Garg R.G., Gupta S. (2011). Review of pathology and genetics. 3rd edition. New Delh: Jypee brothers medical publisher (P) Ltd.
- Kierszenbaum A.L. (2007). Histology and cell biology: an introduction to pathology. 2nd edition. Philadelphia: Elsevier limited.
- Ram M. (2010). Fundamentals of cytogenetics and genetics. 1st edition. Eastern economy edition. New Delhi: PHI learning private limited.

Course title: Advanced diagnostic Immunology

Course code: IMN484

Credit hours: 3(2+1)

Intended semester: (8)

Course duration: 15 weeks

Course description:

T his course covers advanced immunological techniques applied for diagnosis of immuno-logical and non-immunological diseases

Course objectives:

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

1. Describe and explain, as well as, practice advanced immunological techniques.
2. Describe the methods of monoclonal antibody production
3. Define flowcytometry and discuss its principle
4. Define western blot and describe the procedure
5. Discuss vaccine production technologies
6. Discuss the principle and apply the procedures of RIA, ELISA, and IF.
7. Recognize the applications of molecular biology in immunology
8. Discuss histocompatibility and perform tissue typing techniques

Instruction methods:

- Lectures
- Audio-visual presentations
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 40%
- Practical examination: 40%
- Activities:20%

Course description:

Week (1)	Overview of the Immune System 1.

Week (2)	Over view of the Immune System 2.
Week (3)	Immune response (Specific).
Week (4)	Toll like receptors.
Week (5)	Molecular Immunology (RT.PCR).
Week (6)	ELISA, RIA, and IF.
Week (7)	Immunoglobulins and (VDJ Recombination).
Week (8)	Production of monoclonal Antibody.
Week (9)	Flowcytometry and FACS.
Week (10)	Magnetic associated cell sorting (MACS) technology.
Week (11)	Western blot.
Week (12)	Animal models and (Knockout mice).
Week (13)	Vaccine production technology.
Week (14)	HLA and tissue typing 1(Basic).
Week (15)	HLA and tissue typing (Advanced).

Practical:	
Week (1)	Orientation
Week (2)	Quantitative ELISA: Sandwich ELISA
Week (3)	Quantitative ELISA: Indirect ELISA
Week (4)	Quantitative ELISA: Competitive ELISA
Week (5)	Qualitative ELISA
Week (6)	Cell separation
Week (7)	Immuno fluorescence assay (IFA)
Week (8)	Detection of auto-antibodies
Week (9)	Flowcytometry-1
Week (10)	Flowcytometry-2
Week (11)	Flowcytometry-3

Week (12)	Tissue typing-1
Week (13)	Tissue typing-2
Week (14)	Preparation of antisera
Week (15)	Tutorial

References:

- Abbas A.K., Lichtman A.H. (2006-2007). Basic immunology: functions and disorders of the immune system. updated edition. Philadelphia: Elsevier
- Mohanty S.K., Leela K.S. (2014). Textbook of immunology. 2nd edition. New Delhi: Jypee brothers medical publisher (P) Ltd.
- Rich R.R. (2001). Clinical immunology. 2nd edition. London: Mosby international Ltd.
- Sastry A.S., Sandhya Bhat K. (2014). Review of microbiology and immunology. 3rd edition. New Delhi: Jypee brothers medical publishers (P) Ltd.

Corse title: Professionalism and Ethics

Course code: PET485

Credit hours: 2(2+0)

Intended Semester: (8)

Course duration: 15 Weeks.

General description:

This course covers the different health services in Sudan, including levels, programs, primary health care system and principles of health services administration. Also this course covers the quality assurance, the records and the communication skills in the health services including health education, and ethical issues in laboratory practice.

Course objectives:

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

- Primary Health Care.
- Health for all, services

1- Community Describe different health services in Sudan
2- Identify levels of health services
3- Discuss principles of health services adminstration
4- Discuss the various issues of laboratory practice and ethics.

Instruction methods:

- Lectures
- Tutorials and seminars
- Assignments

Evaluation:

- Theory examination: 80%
- Activities:20%

Course contents:

Week (1)	Management in Health: ▪ Concepts ▪ Definitions ▪ Principles of health management
Week (2)	Health team: • Organization • Control
Week (3)	Control and assessment of work.
Week (4)	Ethical issues involved in health services and laboratory practice: ▪ Involvement in Primary Health Care.
Week (5)	Relation between medical laboratory personnel and other health professions
Week (6)	Relation between medical laboratory personnel and patients
Week (7)	Quality assurance in health care services: ▪ Meaning ▪ Tools and advantages of quality assurance in health care services.
Week (8)	Record in health services: • Importance • Methods • Uses • Assessment
Week (9)	Communication skills in management ▪ Information system. ▪ Quality of communication ▪ Types of effective communication
Week (10)	Health education. ▪ Concepts ▪ Methods ▪ Target population ▪ Objectives

Week (11)	Health Education ▪ Environmental. ▪ Epidemiological surveys. ▪ Importance and methods, uses, validity.
Week (12)	Visits to the health facilities.
Week (13)	Medical research ethic-1
Week (14)	Medical research ethics-2
Week (15)	Medical research ethics-3

References:

- Beauchamp Tb Childeress J.F. (2013). Principles of Biomedical Ethics. New York: Oxford University Press.
- Forrestal E.J., Cellucci L.W. (2015). Ethics and professionalism for healthcare managers. 1st edition. Health administration Jr.
- Makely S. (2016). Professionalism in Health care: a primer for career sucessbb. 5th edition. Pearson