



جمهورية السودان

وزارة التعليم العالي و البحث العلمي

الدارة العامة للتعليم العالي و الـجـزبي كـلية

النجـر للعلوم والتكنولوجيا

Alfajr College for Sciences and technology (ACST)

The Program of Medical laboratory sciences (MLS) Bachelor

برنامج بكالوريوس علوم

المختبرات
الطبية

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اعضاء لجنة منهج برنامج بكالوريوس المختبرات الطبية

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Preface:

The medical laboratories sciences developed increasingly in the last years. Nowadays, the clinician decisions is based mostly on laboratories finding, the demand to accurate, reliable diagnosis is being high. The molecular biology and genetics developed greatly in each part of laboratories sciences.

1. Vision

ACTSMLS will be one of the leading Sudanese medical program with an international relationship for its undergraduate, postgraduate and continuing professional development (CPD) program. We hope that this program will be seen as a key partner by the federal ministry of Health Services, Governmental charitable and private organizations for the development of new and innovate national training program for the staff from the entire healthcare and associated professions.

We will be widely regarded as an exemplar for engagement and effective joint working for the benefit of the public, patients and development of the staff. We will encourage translational research and knowledge transfer.

2. Mission

The mission of **ACTSMLS** programs to produce graduates who are competent, professional and leaders in the science of medical laboratories to participate in the development and promotion of its community through high quality and cost effective education, health service and relevant research that satisfy equity and responsiveness to the changing society needs.

3. Our values

3.1 Integrity/ transparency

ACTSMLS program will operate as community trust, supported and established by the citizens of Khartoum State and the Sudan at large. We will conduct our activities with integrity and steward our resources in an ethical manner.

3.2 Respect

In **ACTSMLS**, we will respect our colleagues, our students and our communities. We treat others and their ideas in a manner that conveys respect as we discuss our differences. We

teach our students to respect their patients, other members of the health care team and their colleagues by modeling that behavior.

3.3 Compassion

We will seek students and faculty role models who have this trait and work to enhance it through education, research, and service.

3.4 Collaboration/Generosity/ partnership

ACTS will value that everyone in the region has to offer and believe our collaboration strengthens all. We will work to create partnerships with educational and health related organizations that support our mission to provide our students an inter-professional education and to improve the health of citizens of Khartoum State and the Sudan at large. We will share what we have learned with others and assist whenever possible to serve the people of our state, nation and beyond.

3.5 Discovery & Scholarship

Discovery and scholarship are what differentiate academic medicine. **ACTS** will encourage college and students to continuously seek and advance the creation of knowledge to improve the human condition.

3.6 Student Friendly

ACTS is committed to students having an exceptional educational experience. It will seek feedback from students about improving the process of education, learn from their ideas, and provide educational services in a manner that respect students, support their effort to be good doctors and scientist and provide a quality educational experience. Students will be partners in their education. **ACTS** will seek to encourage students to develop a balance between work and activities to promote a healthy lifestyle.

3.7 Community Health

ACTS is committed to play a role in improving the health status of the community and to contribute to the development of the community. It will involve students, college and staff in creating project and awareness of community health and work with other organization who strive for the same goal.

3.8 Social responsibility

Our students, faculty and staff are part of community, region, state and world. **ACTS** will encourage all to get involved with their area, contribute to its wellbeing and be active volunteers in bettering life. **ACTS** educational focus will emphasize service to the community.

3.9 Best practice

ACTS will not only teach our students, but also shoulder the responsibility of disseminating information to the faculty, laboratory doctors, and health workers, enabling them to change, improve, and transform it to evidence-base medicine practice.

3.10 Quality

ACTS seeks to produce an educational experience of quality: quality in the delivery of patient care and quality in our research and service effort. Additionally **ACTS** Aim to prepare students to understand the process of quality improvement in the practice of medicine.

3.11 innovation

Innovation is the heart of **ACST** and thus it will be open to new ideas from faculty, students, and staff, seeks out new ideas and will evaluate them with open minds in order to continue to improve the efficacy of health care and the health system.

3.12 Stewardship

ACST has been entrusted with a great responsibility – the education of the next generation of physicians. This mandates that we live our values and focus on our mission to serve through education, research, clinical care and community service.

3.13 Communication

ACST wants to instill in our student an understanding that good communication is a large part of being a good doctor. It will work to develop communication skills in student. It will also remember that many people support the school from throughout the region and work to not only communicate our progress but to listen to their feedback and hopes for the college. It will communicate also with student, faculty, other members of the healthcare team and staff both by listening to ideas and sharing plans.

3.14 lifelong learning

ACST encourages students to understand the process of growth and learning is continual. It will seek faculty who model the desire to learn and improve practice, develop continuing medical education offering to the region and prepare students to modify practice based on new evidence.

4. Rationale & justification

4.1 Provisions of an innovative medical education of program by the charity medical education institute.

4.2 A good addition to delivering of high quality health services in densely populated area such as Khartoum state

4.3 Availability of large number of pensioners with wealth of experience in innovative medical education and health service delivery.

4.4 Provision of extra changes in innovative program of medical education for large number of Sudan general certificates students who obtained the required percentage set by ministry of higher education.

5. Admission requirements

The admission is according to the regulation set by ministry of high education and scientific research. .And after the interview and medical check, students should strictly adhere to the academic regulations of Alfajr College.

6. Assessment of the needs and values

The need and values of the community, learners and subjects-matter (biomedical sciences) will be assessed. The educational goals and rationale of the curriculum were derived from the need and values. Then the general objectives and specific objectives (characteristic of the graduate) were set-based on the need and values.

- 1.1.** Subject matter needs.
- 1.2.** Community needs
- 1.3.** Learner's needs

6.1 Subject matter needs

The remarkable advances in the contents of biomedical/health e\sciences and how they are taught learn and evaluated reviewed.

Following are examples of subject matter needs:-

6.1.1 Anatomy

6.1.2 Biochemistry

6.1.3 Physiology

6.1.4 Pathology

6.1.5 Microbiology

6.1.6 Molecular biology

6.1.7 Haematology

6.1.8 Parasitology

6.1.9 Chemical pathology

6.1.10 Histopathology

6.1.11 Immunology

6.1.12 Research methodology and biostatistics

6.2 Learners needs

6.2.1 Skills of using library (conventional and electronic)

6.2.2 Enough time for self-learning

6.2.3 Academic advisors

6.2.4 Student support and well fare.

7. Objectives

1. Graduate a health professional with a bachelor's degree in Medical Laboratory Science and Technology (B.MLST), competent in laboratory sciences and skills, with strong community orientation, social and ethical commitments, aware of and utilizing all recent and emerging developments in evidence-based laboratory science education and practice.
2. Contribute to community development through health services provided in its own health institutions, and other institutions cooperating with them, through: (a) partnership in designing health programs and plans, and implement whatever is feasible in utilizing the specialists, (b) contribute in continuous education, through self-directed learning of technologists, and (c) provision of essential equipment and supplies to improve the

- quality of health services planned by the ministries of health and other related sectors.
3. Strengthen medical and health research in MLS, making use of the ACTS infrastructural privileges and national and international relations.

8. Program outcome (characteristics of MLS graduate)

A graduate of Alfajrcollege of-MLS Program should be able to:

1. Adopt the strategies of the Academy and abide by its objectives, rules and regulations.
2. Observe, in his/her practice, the health professional ethics which agree with the Nation's values, beliefs and norms (as stated by Sudan Allied Health Professions' Council), and maintain good and honest relations with her/his, their families, his/her colleagues across all sectors involved in health.
3. Appreciate the value of diversity and multi-ethnicity in solving laboratory work with emphatic, humane and fair practice.
4. Integrate basic, community, laboratory and clinical sciences in solving community, family and individual health problems relevant to laboratory sciences.
5. Use scientific knowledge in investigating health problems, according to known methods and procedures, and show understanding of the scientific structural (anatomical), functional (physiological, biochemical), morbid (microbiological, pathological), and therapeutic (pharmacological) background related to the problem.
6. Take specimens timely and professionally, and arrange for comfort of the patient and relatives, especially in tests taking longer time.
7. Follow correctly the practical steps of completion and explanation of testing biochemical, hematological, immunological, microbiological and histochemical components in biological specimens
8. Differentiate color, smell, clarity and viscosity of biological and chemical specimens relevant to human health.
9. Carry out the correct histological and histochemical techniques and use correctly the facilities of light microscope.
10. Show understanding of the techniques for ultrastructural or electron microscopy, outline the components of transmission and scanning machines and recognize images from both.
11. Run laboratory test using common equipment and take safety precautions of fellow workers, patients, public, equipment and building- in dealing with chemicals and specimens.
12. Manage the investigative plan in emergencies and life-saving situations, and decide and act properly on cases needing referrals to specialized centers and personnel.
13. Accept to work in all settings according to needs, and act to improve health service delivery system both quantitatively and qualitatively.
14. Encourage community participation and help in recruiting various sectors in defining health related problems, planning and providing suitable solutions, recognizing the community beliefs, ethics and traditional practices.
15. Adhere to the "health team" approach, acting as an efficient member, accepting labor and responsibilities given to its members, and promoting both effectiveness and homogeneity

among members.

16. Continue to consider elements of efficiency, costing and economic implications in her/his approach to (and choice of) laboratory procedures.
17. Acquire the skills of teaching, learning and communicating efficiently to carry out his/her duties in health education and in winning the confidence of patients and their families.
18. Show respect to patients, supervisors and colleagues using productive communication with each of them, and observing confidentiality at all levels of communication and care.
19. Acquire the skills of independent learning and contribute to availing opportunities for planning and implementing continuous educational activities to upgrade her/his own abilities and those of his/her colleagues in the health team, benefiting from the rising tide of information technology.
20. Carry out health and health-related research, alone or with the other members of the team in health or with other relevant sectors, using known (or approved) scientific methods.
21. Use computers in word processing (both Arabic and English), presentations, spread sheets, statistical packages and graphics to achieve success in other objectives of his/her career.
22. Acquire postgraduate qualifications in the discipline of her/his choice, recognizing the needs of the society for certain specialties, particularly parasitology, immunology, molecular biology, drug development, production and maintenance of medical laboratory equipment, media, reagents and other supplies.

9. The curriculum and the educational system and its duration

The educational system and curriculum is credit hours, semester system. The duration is four years distributed into eight semesters.

10. Educational strategies

1. The learning strategies emphasize the following:
2. Early acquisition of basic skills
3. Student-centered learning, and maximum student responsibility in the learning process
4. Community-oriented and community-based activities
5. Self- and peer- education and evaluation, wherever relevant
6. Team-work attitude
7. Continuous evaluation
8. Preparation for continuous professional development.

11. Educational methods

The College adopts the following methods in the daily program of activities:

Lectures.

Practical sessions.

Field training.
Seminars, tutorials, and small group discussion.
Problem based learning (PBL).
Educational assignments, reports and research activities.
Skill laboratory session.
Filed practice.
Role play.
Case presentation.
Thesis and graduation projects.

12. Educational language

The Instructional Language is The English Language

13. The degree offered

Alfajr college laboratories sciences program offers the **general Bachelor degree of medical laboratory sciences** to those who complete the courses approved by the **Ministry of High Education of Sudan** successfully according to the regulations of Alfajr College.

(البكالوريوس العام في علوم المختبرات الطبية)

14. The number of students for admission

100 students

15. Resources

Physical resources

Lecture Theater (2)

Laboratories (3)

Library (2)

D.R (1)

Human resources

Academic staff (permanent and part-timer)

Lecturers (3)

Assistance professors (1)

Associate professors (1)

Professors (1)

Teaching assistance (2)

Technicians (1)

Librarians (1)

IT expert (1)

References for students

Textbooks

Journals

Hand out

Internet

Evaluate the program every 3 years.

16. The Program, curriculum plan and the educational system and its duration

The educational system and curriculum is credit hours, semester system. Its duration is four years distributed into eight semesters:

Phase 1: Introductory courses, basic sciences, and basic medical sciences Semesters 1-2

Phase 2: medical laboratory sciences, molecular biology, pathology and immunology Semesters 3-6

Phase 3: specialization biostatistics, research methodology and research project semester 7-8

Each semester extends 17 to 20 weeks and the total number of credit hours is 160 credit hours

17. Student evaluation

Both formative and summative assessment should be applied, using reliable and valid assessment tools that are properly aligned to our methods of instruction and the stated desired learning outcomes.

An assessment and evaluation office would support the development of high quality assessment tools and their utilization to enhance learning; and to monitor both student's performance and the progress, and the quality of the curriculum.

Assessment on all domains of learning are to be conducted throughout the year employing both formative and summative assessment types. Although the formative type are meant for

diagnosis & feedback, a percentage not exceeding 20% of the final mark can be calculated from the students assignments, tutorials, presentations and tests all of which are considered as a form of continuous assessment. Student's attendance is for the eligibility of sitting for the exam.

Assessment tools are to be used for both types & summative such as:

Written

MCQs: As single best answer or single correct answer.

SAQs short answer question (As structured as possible). Applied where appropriate

Long essay question

Assessment schedule:

Assessment method	Details	Percentage
Continuous assessment	Lab performance. Assignments. Tutorials, seminars, mid- course exam.	20%
Practical	Final exam	40%
Theory	MCQ , SAQ, long essay	40%
Total		100%

18. Available staff

The available staff for the program including:

Prof.Mubarak Mohamed Ali Elmagzoub (Professor of chemical pathology)

Dr. MowaoiaHussienElobied (Associate Professor of pathology and)

Dr. AlbaraAbdulfatah Mohammed (Assistant professor of Haematology and immunhaematology)

Elshareif Hussein mohammedali (Lecturer of histopathology & molecular biology)

Rania Hasan Mohammed Ahmed (Lecturer of Physiology and immunology)

BabikerSubahi (expert and senior lab technician in instrumentation and lab equipments)

AmroAbudulwahabAbualgasim (Lecturer of computer sciences)

19. Curriculum map

First year first semester:

Code	Course	Credit hours			Duration
		T	P	Total	20w
L-SDS111	Sudanese studies	3	0	3	2w
L-ENG112	English language	3	0	3	3w
L-ARB113	Arabic language	3	0	3	3w
L-ISS114	Islamic studies	3	0	3	3w
L-CHB115	Cell & human biology	2	1	3	3w
L-COM116	Computer science	0	1	1	1w
L-GCH117	General Chemistry	1	1	2	3w
L-MPH118	Medical physics	1	1	2	2w
		17	3	20	20w

First year semester2:

Code	Course	Credit hours			Duration
		T	P	Total	
L-SDS121	Sudanese studies	3	0	3	3w
L-ENG122	English language	3	0	3	3w
L-ARB123	Arabic language	3	0	3	3w
L-ISS124	Islamic studies	3	0	3	3w
L-BIO125	Biochemistry	2	1	3	3w
L-PHY126	Physiology	2	1	3	3w
L-ANA127	Anatomy	1	1	2	2w
	Total	17	3	20	20w

Second year: semester 3:

Code	Course	Credit hours			Duration
		T	P	Total	
L-LSB211	lab safety & Basic lab skills	2	1	3	1w
L-MIC212	Microbiology I	2	1	3	Long
L-HEM213	Hematology I	2	1	3	Long
L_PAR214	Parasitology I	1	1	2	Long
L-CHP215	Chemical pathology I	2	1	3	Long
L-HIS216	Histopathology I	2	1	3	Long
L_MOL217	Molecular biology and genetics	2	1	3	3w
	Total	13	7	20	20w

Second year semester 4:

Code	Course	Credit hours			Duration
		T	P	Total	
L-MIC221	Microbiology II	2	1	3	Long
L-HEM222	Haematology II	2	1	3	Long
L-PAR223	Parasitology II	2	1	3	Long
L-CHP224	Chemical pathology II	2	1	3	Long
L-HIS225	Histopathology II	2	1	3	Long
L-IMM226	Immunology	3	1	4	3w
L-IST227	Inservice training	0	1	1	2w
	Total	13	7	20	20w

Third year: semester 5:

Code	Course	Credit hours			Duration
		T	P	Total	
L-MIC311	Microbiology III	2	1	3	Long
L-HEM312	Haematology III	2	1	3	Long
L-PAR313	Parasitology III	2	1	3	Long
L-CHP314	Chemical pathology III	2	1	3	Long
L-HIS315	Histopathology III	2	1	3	Long
L-PAT316	General pathology	2	1	3	Long
L-IST227	In service training	0	2	2	Long
	Total	12	8	20	20w

Third year: semester 6:

Code	Course	Credit hours	Duration
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		T	P	Total	
L-MIC321	Microbiology IV	2	1	3	Long
L-HEM322	Haematology IV	2	1	3	Long
L-PAR323	Parasitology IV	2	1	3	Long
L-CHP324	Chemical pathology IV	2	1	3	Long
L-HIS325	Histopathology IV	2	1	3	Long
L-LMQ326	Lab management and quality control	2	0	2	1w
L-IST327	In service training	0	3	3	Long
	Total	12	8	20	20w

Fourth year: semester 7:

Code	Course	Credit hours			Duration
		T	P	Total	20w
L-AHI411 or L-AMI411 or L-APA411 or L-ACH411 or L-AHI411	Advanced (Microbiology/ Hematology/ Parasitology/ Chemical pathology/ histopathology)	5	3	8	Long
L-IST412	In service training	0	4	4	Long
L-REM413	Research methodology	3	0	3	2w
L-BST414	Biostatistics	2	0	2	2w
L-THE415	Thesis	0	3	3	Long
	Total	10	10	20	20w

Fourth year: semester 8:

Code	Course	Credit hours			Duration
		T	P	Total	18w

L-AHI421 or L-AMI421 or L-PAR421 or L-CHP421 or L-HIS421	Specialized subject (Microbiology/ Hematology/ Parasitology/ Chemical pathology /histopathology)	5	3	8	Long
L-IST422	In service training	0	5	5	long
L-ALT 423	Advanced laboratory techniques	2	1	2	2w
L-THE415	Thesis	0	4	4	Long
	Total	8	12	20	18w

20. Curriculum map details

Course code: L-SDS111

Course title: Sudanese studies

Credit hour: 6.hr

Course description:

This course gives the student an idea about the Sudanese society, its development in the past, present and its future.

Objectives:

1. To study the general features of Sudan geographically, historically ethnically and politically.
2. To study the resources of Sudan.
3. To study the effect of Sudan on his its neighbors.

Contents:

1. An introduction to Sudan geographically and historically.
2. The development of Sudan as an independent political unit.
3. The development of the administration system in Sudan.

4. The political and administrative opinions in Sudan.
5. The effect of Arabian and African ideologies on the Sudanese character.
6. The origin of the Sudanese culture and ethnicity of Sudan.
7. The geographical and political effect of Sudan.
8. The Sudanese economy.
9. The education system in Sudan.
10. The national role of universities in Sudan.

Evaluation: according to the general evaluation methods.

References:

1. ZainabZubeir. Sudanese studies. 1st edition. Khartoum University press. 2010.

Course code: L-ENG112

Course title: English

Credit hour: 6

Courses Descriptions:

This course is offered by the Medical Department of the English Language Center of the University. The course aims to develop the English language competence of medical students in those linguistic areas and to those proficiency levels agreed upon by the ELC and the college.

Objectives:

1. The objectives of the module for general English are:
 - a. Basic handwriting skills
 - b. Spelling
 - c. Grammar and basic sentence structure
 - d. Oral proficiency and pronunciation
 - e. Listening and note taking
2. English for medical sciences
 - a. Definition of medical terminology
 - b. Reading and comprehension of medial passages
 - c. English composition or essay on related topics of medicine
 - d. Listening to medical lectures and note taking
 - e. Medical summaries
 - f. Oral presentation of medical research

Content:

The beginning of the course concentrates on the

* basic skills of general English as exemplified in the four basic disciplines: reading, writing, listening and speaking. Later, it incorporates medical themes to aid and reinforce the kind of English encountered in medical contexts.

* The definition of medical words and terminology involves combining forms, prefixes and suffixes of Latin and Greek roots. The reading passages involve guessing meaning from context and deduction together with the use of dictionary and vocabulary.

*The organization of ideas, usually medical, evolves from topic sentence together with supporting ideas and examples or illustration into a paragraph and finally into a written essay comprising an introduction, body and conclusion. Listening to medical lectures involves note taking in preparation for questions on comprehension. Oral presentation of a piece of a medical research, which is thoroughly prepared and learnt, is chosen by the individual student as a practical exercise.

* Summary of medical topics or passages is also practiced. An interactive component in the module is included in the computing laboratory by means of the Internet

*Nouns

Compound nouns; Nouns with the same form as verbs; Nouns+ of this kind;
Nouns+ ending in -ion, y, -ance, -ence, -ment; Nouns ending in -al, -or, -ability,
-ability; Present, past participle+ noun; That, those to replace nouns; Of+
(adjective) noun; That to replace singular noun; and Those to replace plural
nouns.

* Infinitive and Verbs

Was seen + infinitive; Is said + infinitive; Can be + past participle + infinitive,
present participle; Infinitive to replace so that, result that; Verbs formed with-
fy, en-, en; Verbs meaning show; Verbs formed from nouns; Has to replace other
verbs; On....ing to replace when +verb.

* Past participle, Past and present participle

Before being + past participle; In, un before adjectives/ past Participle Is said to
have + past participle; When / if past participle; Which + passive + to be +past
participle; Which + passive + to have +past participle; Present participle to replace
which + verb; Contraction of which + present; Description of experiment (passive)

* Passive and Adjectives

Passive with agent; passive without agent; Contraction of which+passive;
Negative passive + infinitive; Passive + to have + past participle; Passive
Summary writing; Adjective ending in -ar, -ic; Adjective +enough +infinitive;

Is said to be + adjective; Un-, in-, im-, ab- +adjective

*** Omission**

Omission to avoid repetition; Omission of preposition; Omitting nouns to avoid repetition; Do, does, did to avoid repetition.

*** Miscellaneous1**

Known as; On /after...ing; Foring purpose; Question word + ever; Provided with; Able, unable to = can, cannot; The case; In that case; BY that meant; Being showing result / reason; Owing to the fact that; And vice versa; And vice versa; Not.....But.....; The former / The later

Miscellaneous2

Of which to replace whose; Having to replace which has, have; The more...the more.....; By this is meant; Although; Differ / worry; The reason for . . is that; Due to the fact that; If it were not for; Contraction of relative clause; Phrase or clause to begin a sentence; Possess to replace have; Might to express doubt, Of which to replace whose; Having to replace which has, have; Themore...the more.....; By this is meant; Although; Differ / worry; The reason for . . is that; Due to the fact that; If it were not for; Contraction of relative clause; Phrase or clause to begin a sentence; Possess to replace have; Might to express doubt,

Evaluation: according to the general evaluation methods.

References:

1. Tanka & Baker, Interactions 2 Listening/Speaking, 4th Ed. 2004.
2. Chabner Saunders, The Language of Medicine, 7th Ed. 2005
3. Peggy S. Stanfield, Y.H Hui, Nanna Cross. Essential medical terminology. 4th edition. 2015

رمز المقرر L-ARB113

اسم المقرر : اللغة العربية

الساعات المعتمدة 6 :

محتوى المقرر :

يهدف الكورس الى اللام بالغة وقواعدها وصياغة المصطلحات العلمية والترجمة

الهدف :

معرفة الأسس والمفاهيم العلمية التي تساعد. تجويد الرسم الإملائي المستعمل في الفروع والاصول ونهم المصطلح العلم بالمعرب

الطلاب في الاستفادة من المراجع العلمية المكتوبة باللغة الإنجليزية.

الإسهام بصورة ناعلة في سياقات التعليم العالي بدفع عجلة التعريب - .معرفة

حقيقة اللغة ونشأتها ومعالجة الأخطاء الشائعة بين الطالب

- إللام بصياغة المصطلح العلمي ووضعه من المصادر المختلفة - معرفة بعض العلوم المساعدة في وضع المصطلح العلمي كالنحت والشق والنق
- إللام بؤواع وأساسيات الترجمة والتعريب.

محرر الألفاظ:

اللغة ونشأها

الفرق بين اللغة وعلم اللغة

نانذة على اللغة :معالجة الأخطاء الشائعة وسط الطالب :

أساليب الكالم :الإيجاز والإطناب والمساواة

الترقيم :ألغراض

الترقيم : عالماته واستخدماتها

المصطلح العلمي : قوانين صياغة المصطلح العلمي.

وضع المصطلح العلمي من التراث .

وضع المصطلح العلمي من الطرق المتعددة لتوليد الألفاظ

المراجع:

القاموس المحيط الفيروزبادي الشيخ

الحمالوى شذى العرف في فن الصرف

Course code: L-ISS114

Course Title: Islamic Studies

Credit hour: 6

Course description:

The course aims to reflect the characteristics of Islamic community and the basics it depends. And represent the Islamic regulations regarding to the family creation and focusing on the mother role in the family and community, then Islam sunnat in marriage and children education in order to save and preserve the family, which results a community strengthening, and finally how Islam resolve the problems regarding the family and community problems.

Objectives

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

- Associate religion with different patterns of human behavior.
- Acquire the concepts of coherence of the Islamic nation which emerges from the faith in the only Allah, the creator and the designer of this universe.
- Understand the basic concepts of Islamic culture, of science and Islamic ethics.
- Gain knowledge about belief, values, sociology, politics and economics.

Contents:

- Islamic culture definition
- Islamic belief, cults and worship
- contemporary religious
- Islamic parties and creeds
- doubts raised against Islam
- polygamy
- introduction to Islamic laws
- introduction to holy Koran sciences ,
- sunna of the prophet
- Principles of Islamic jurisprudence.
- Islamic economic and social systems.
- Science and religion.

- Ethics of discussion and arguments.
- Scientific inimitability in holy Koran.
- Muslim physician jurisprudence.

Course code: L-CHB115

Course Title: Cell and human biology

Credit hour: 2+1

Course description:

During the course, students learn the basic biological concepts relevant to the study of laboratory medicine. The course provides a preparatory background for entry into the second year courses. The syllabus provides opportunities for learning appropriate terminology for the study of basic medical sciences.

Objectives:

This course aims at providing the student with the basic knowledge about cell biology which is essential for studying the molecular biology that recently became one of the main disciplines in medical laboratories sciences.

Contents:

The course covers the following subjects:

- 1- Basic cell structure
- 2- Characteristics of Prokaryotic & Eukaryotic cells:
 - Cell theory
 - Properties of cells
 - Types of cells
- 3- Structure and function of organelles.
- 4- Structure and function of the cytoskeleton
- 5- Introduction to Membranes
- 6- Membrane structure and composition diagram Fluid Mosaic Model
- 7- Membrane proteins structures
 - Domains
 - Glycoprotein's
 - Multi-membrane- spanning proteins
- 8- Membrane transport mechanisms
 - Diffusion and osmosis
 - Facilitated diffusion
 - Active transport
 - The Glucose- Na⁺ Transport System
- 9- Membrane specialized contacts
- 10- Chromosomes and cell cycle
 - Chromosomes

- Prokaryotic cell division
- Eukaryotic cell cycle

11- Mitosis

12- Cell reproduction (Meiosis).

Practical:

- Microscopic structure of the cell.
- Identification of eukaryotes and prokaryotes
- Demonstration of cell membrane structure
- Diffusion and osmosis
- Microscopic identification of cell division

Evaluation: according to the general evaluation methods.

References:

1. Karp, Gerald, Cell and Molecular Biology, 5th Ed., Wiley, 2008.
2. Larry L. Mai, Marcus Young Owl, M Patricia Kersting. Mai, Larry L. Cambridge Dictionary of human biology and evolution. 2005.
3. Bocye Rensberger. Instant biology: from single cells to human beings, and beyond, 1st edition. 1996.
4. Elizabeth Martin, Robert S. Hine. Dictionary of biology. 2008.

Course code: L-COM116

Course Title: Computer sciences

Credit hour: 0+1

Course description:

The course provides a practical hands-on introduction to computers and main stream computer applications. The course will contain Microsoft office word and Microsoft office power point applications

Objectives:

At the end of the course, and having completed the Essential reading and activities, you should be able to:

1. Demonstrate knowledge about computer history
2. Apply and use Microsoft office word and learn how to write reports.
3. Apply and use Practicing with Microsoft office power point and learn how to create presentations.

4. Have skills of writing, editing and presenting.
5. Use the computer and information technology in his field of study.
6. Browse and search the various internet websites for his educational needs.

Contents (practical):

1. Windows XP
2. Windows XP
3. Introduction to Microsoft office word.
4. Home Tab Writing Font
5. Home Tab Paragraph
6. Insert tab pages Table
7. Insert Table illustrations
8. Insert TabHeader and footer Text Symbols
9. Page layout tab Page background Page setup
10. Microsoft Power point introduction and slides
11. Power point Design of slides Animations
12. Power point Insert Example of presentation
13. Presentation (by students)
14. Microsoft Excel.

Evaluation according to the general evaluation.

References

1. Shelley O'Hara, Paul Wray, Introduction to Computers and the Internet for Seniors, Prentice Hall. 2001.
2. A Bessant, Learning to Pass ECDL 4.0 for Office XP, Heinemann Educational Secondary Division. 2004.
3. David Vernon. Introduction to computer systems. 2007.

Course Code: L-GCH117

Course title: General chemistry

Credit hour: 1+1

Courses Descriptions:

This course aims to help students to acquire knowledge and skills in chemistry essential to the study of medical sciences, particularly biochemistry, physiology, pharmacology and clinical chemistry. The department aims also to introduce the student to the fundamentals of scientific habits and attitudes and the use of scientific terminology which will facilitate their study of basic medical sciences.

Objectives:

1. To provide the students with the basic concepts and ideas in the following subjects:
 - a. Physical quantities and their units, the use of dimensional analysis for solving problems, and the use of scientific notation for representing numbers.
 - b. Reaction stoichiometry and the limiting reactant concept.
 - c. Theories of acids and bases, strong and weak electrolytes, the auto-ionization of water, the pH concept, and equilibrium in electrolyte solutions.
 - d. Properties of gases, liquids, solids and solutions.
 - e. Nomenclature of organic compounds and their chemical reactions.
 - f. The bases of carbohydrates, amino acids, lipids, and nucleic acids.
2. To develop the students' practical skills in the laboratory sessions in the following areas:
 - a. Identifying unknown inorganic salts.
 - b. Standardization of solutions, acid-base and redox titration.
 - c. Identifying simple aliphatic and aromatic organic acids and acid salts.
 - d. Identifying and classifying carbohydrates.

Contents:

- A. Physical Chemistry Topics: Stoichiometry, Chemical equilibrium. The gaseous state, the liquid state, Solids and the crystalline state, Equilibrium: aqueous solutions (ionic equilibrium), Thermo chemistry and thermodynamics, Chemical kinetics (rate processes), electrochemistry.
- B. Organic Chemistry Topics: Bonding in organic compounds. Structure and isomerism, Types of organic reactions, Aliphatic saturated hydrocarbons, Aliphatic unsaturated hydrocarbons, Aromatic hydrocarbons, Optical isomerism and stereochemistry, Organic halogens compounds, Alcohols, phenols and others, Aldehydes & ketones – Introductory carbohydrates, Carboxylic acids and derivatives – Introductory lipids, Amines – Introductory amino acid and peptides, Heterocyclic compounds – Introductory nucleic acid, Spectroscopy: NMR, IR, UV-VIS and Introduction to MRI.

Practical:

- Reactions of organic compounds
- Physical properties of chemical substances
- Determination of chemical reactions rate & chemical kinetics
- Detection of heat & electrical energy in chemistry

Evaluation: according to the general evaluation methods.

References:

1. Whitten, Davis and Peck. General Chemistry with Qualitative Analysis, Saunders College Publishing.
2. CRC Handbook of Chemistry and Physics, 88th Edition. 2007.
3. Graham Solomon's and Jryhle. Organic Chemistry. John Wiley & Sons, Inc.

4. Paula Bruice. Organic chemistry. 4th edition. 2003.

Course code: L-MPH118

Course Title: Medical physics

Credit hour: 1+1

Course description:

This course provide the students with the principles of physics with special emphasis to its application in the field of lab medicine.

Objectives:

- Know the scientific terms, fundamental units and basic principles of physics related to medicine and allied sciences.
- Be aware of some apparatus and understand the techniques used in the solution of some of the medical science problems. -.
- Be able to understand and interpret information presented in tables, graphs and mathematical equations.
- Re capable of understanding how main facts and generalizations can provide explanations of familiar phenomena in the human body.
- Be able to present the results at practical work in the form of complete, understandable and objective reports.
- Be aware about the stability and balance
 - Be aware of the role of magnitude and direction of various forces acting on the musculo-skeletal system

Contents:

- Torques - Mechanical equilibrium and Center of Gravity of Human Body
- Stability and balance-Mechanical Advantage-Levers in the Body.

On completion of this course the student will understand the main physical concepts which provide explanations of biological phenomena in the human body. The student becomes familiar with scientific and language.

The course provides theoretical and experimental studies introducing scientific terms, fundamental units and basic principles of physics related to medicine and allied sciences. **Heat**

Objectives:

The student should be aware of the role of internal energy changes and human metabolism.

Contents:

Energy change in the body (1. law of thermodynamics & human metabolism)

Fluid Mechanics

On completion of this part the student will:

1. To be aware of the relations of pressure, density and flow rate of real fluids to study the circulatory system of the body
2. Understand the principles of surface tension so as to appreciate the role of the surfactant in the lungs.

Contents

- Bernoulli's equation
- The Role of Gravity in the blood Circulation
- Flow in the Circulatory System and the flow resistance
- The Surface Tension - Surfactant in the Lungs

Electricity

On completion of this part the student will be able to:

1. Understand the concepts of electrical potential, current, resistance and capacitance
2. Apply the above concepts to nerve conduction (R-C circuit and pacemaker)
3. Know the types of electrical signals from the human body and the measuring instrumentation (ECG and EKG)

Contents:

- Capacitance, direct current, resistance and R-C circuits Electricity within the body:
- The structure of nerve cells - the resistance and capacitance of an axon
- Ionic concentrations and resting potential (Nernst Equation, the Na⁺ - K⁺ pump)
- The response to weak stimuli - the action potential (Myelinated Axon)
- The electric signal from heart and brain

On completion of this part the student will be acquainted with:

1. Production and propagation of sound waves
2. The range of sensitivity of the human ear to frequency and loudness
3. The properties of ultrasound waves and some medical applications
4. Understand the image formation by lenses in order to appreciate the correction of optical defects of the human eye

Sounds and optics

Contents:

- General properties of sound waves
- Sound detectors (human ear) - Auditory response (threshold of hearing and feeling)
- Ultra Sound (Physical Principles - Instrumentation and Display)
- The Doppler effect and the Doppler flow meter
- Physical properties of light waves - total internal reflection (Colon fiberscope)

- Lenses - image formation - a power of a lens (aberrations)
- The human eye-Optical defects of the eye and the corrections (Myopia Hypermetropia, Presbyopia and Astigmatism)
- Lasers in medicine.

Practical;

- Measuring temperature
- Measuring pressure
- Detection of sound waves
- Detection & quantization of action potential
- Microscope parts identification and uses.

Evaluation: according to the general evaluation.

References:

4. Joseph W. Kane and Morton M. Physics, 3rd edition, Sternheim, John Wiley and Sons. .1988
5. A. H. Gamer. Physics for Life Sciences, McGraw Hill International, Tokyo, 1981.

Course code: L-BIO125

Course Title: Biochemistry

Credit hour: 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

Objectives:

1. chemical composition of water particles and their role in the body.
2. structure, function, and importance of carbohydrates.
3. Structure, function, and importance of fat.
4. Structure, function, and importance of proteins.
5. Structure, function, and importance of nucleic acids and their role in heredity.
6. Role of energy resulting from carbohydrate and fat metabolism and the factors affecting it.
7. Vitamins.
8. Laboratory differentiation of normal and abnormal urine components.
9. Determining the level of glucose and urea in blood.

Contents:

1. Introduction and definition of biochemistry
2. Chemical bonds and their types - water and hydrogen bond
3. Study of carbohydrate and protein structure and their important functions in the body
4. Energy Metabolism of and main compounds (sugar, fat, protein, and amino acids)
5. Study of fat and water soluble vitamins
6. Cellular biology - genes and their structure, expression, and passage of genetic information
7. Movement, specially muscle contraction
8. Hormones and how they affect metabolism
9. Vitamins

Practical;

- Determination of pH
- Reactions of carbohydrates
- Reactions of lipids
- Reactions of proteins
- Factors affecting enzyme activity

Evaluation: according to the general evaluation.

References:

1. Champe, Harvey and Ferrier. Lippincott's Illustrated Reviews of Biochemistry. Lippincott Williams and Wilkins. 2005
2. T.N. Pattabiraman Concise text book of Biochemistry. 3rd edition. 2001
3. S. Ramakrishnan and S.V. Rao. Nutritional Biochemistry. 1995
4. T.N. Devlin .Text book of Biochemistry with clinical correlations. 1997
4. R.K. Murray et.al. Harper's Biochemistry, 1996.

Course code: L-PHY126

Course Title: Physiology

Credit hour: 2+1

Course description:

His course gives a general idea about the human physiology and how the different body system coordinate with each for homeostasis.

Objectives:

- 1- understand the relationship between different human activities and the factors affecting those activities.
- 2- -know the information and physiological terminology needed to acquire adequate knowledge of the human physiology.
- 3- -understand the vital processes that happen inside the human body and use this information in applying nursing sciences.
- 4- -execute some simple and important tests and know their normal values, so that he could well plan the application of the nursing process.

Contents:

1. Introduction to physiology:
2. Cell and its function - distribution and measuring of fluids in the human body - fluid exchange - physiological control systems - autonomic nervous system - excitability.
3. Homeostasis
4. Body temperature
5. Body fluids
6. Electrolytes
7. Acid base balance
8. Haematology

Practical;

- ☐ Measuring body temperature
- ☐ Measuring blood pressure
- ☐ Detection of heart sounds
- ☐ Measuring Hb, ESR & PCV

Evaluation: according to the general evaluation methods.

References:

1. Kim E. Barrett, Susan M. Barman, Scott Boitano, Heddwen L. Brooks. Ganong's Review of Medical Physiology. 25th edition. The McGraw-Hill. 2016.
2. Jone E. Hall. Guyton and Hall Textbook of Medical Physiology. 12th edition. Elsevier. 2016.

Course code: L-ANA127

Course title: Anatomy

Credit hour: 1+1

Course description:

This course gives a general idea about the gross anatomy of the human body with emphasis on the microanatomy and histology.

Objectives:

1. Develop a scientific image concerning the position of the human race in the living world.
2. Understand the structure and morphology of human body systems and organs.
3. Know the information and terminology needed to acquire the scientific skills upon which the laboratory sciences are based.
4. Recognize sound and intact body organs, and recognize any defect.
5. Study the histology of the different body systems.

Contents:

1. Introduction: anatomy and its terminology, and general histology.
2. Anatomy of the different body systems.
3. Embryology: Gametes, fertilization, formation of the embryo, fetal membranes, amniotic fluid, development of organs and congenital anomalies.
4. Histology of different body systems.

Practical;

- Dissecting & identification selected parts of circulatory system
- Dissecting & identification selected parts of digestive & urogenital systems
- Identification of selected parts of skeleton
- Microscopic structure of selected body tissues

Evaluation: according to the general evaluation methods.

References:

1. Richard S Snell : Clinical Anatomy. 9th edition. Lippincott Williams and Wilkins. 2012.
2. Chummy S. Sinnatamby. Last's anatomy. 12th edition. 2011. Church livingstone.
3. Neeta V Kulkarni. Clinical anatomy. 2nd edition. 2014.
4. Eroschenko VP. Di Fiore's Atlas of Histology with Functional Correlation, 10th edition. Lippincott William and Wilkins. 2005.

Second year- Semesterthree

Course Code: L-LSB211

Course Title: Laboratory safety & Basic skills

Credit hour: 2+1

Course description:

This course consists of theoretical and practical study of biosafety in the medical laboratory. The emphasis is in knowledge of the hazards encountered when working with biological or chemical material & the practice of biosafety procedures. The course includes the application of combinations of laboratory practices, procedures, facilities & safety equipment required when working with potentially harmful micro-organisms, radioisotopes or chemicals.

The course discusses the role of basic laboratory skills. The course is designed to provide the Student with the primary and essential skills in the practical line.

Objectives:

- ☐ List major types of skills in the measurements
- Emphasize on the correct use of equipment's and tools in the laboratories.
- ☐ Discuss the role of accurate weighting and volumetric measurements.
- ☐ Identify the errors related to the measuring process.
- ☐ Define the commonly used equipment in the lab Define the safety process, hazards, and the records.
- ☐ Define the safety process, hazards, and the records (scientific result can be interpreted) and the safety procedures in the measuring process.
- ☐ Discuss the principle of the instruments, and how it
- ☐ Applies laboratory safety protocols.
- ☐ Carries out risk assessment.
- ☐ Outlines the principles of general laboratory requirements ensuring an adequate level of protection in the transfer & handling of living or modified microorganisms using modern biotechnology.
- ☐ The course aims at providing the students with adequate knowledge so as to prevent laboratory deficiencies, unreliable test results and to maintain the clinical value of laboratory services and providing accurate laboratory information for the management of patients.

Contents:

- ☐ General techniques: have the right equipment and supplies

and use them properly i.e. burners and electric heating devices.

- Measuring weights: know how to use laboratory balances.

Measuring volumes: know how to use volumetric glassware.

- Other measurements: be able to make other analytical measurements when they are called for.

- Records: keep proper records and ensure that your data is reliable

- Biosafety guidelines.
- Microbial risk assessment.
- Biosafety levels ,lab design & facilities
- lab equipment, health & medical surveillance
- Safety training & waste handling
- Laboratory animal facilities levels 1 to 4
- Guidelines for lab facility commissioning & certification.
- Laboratory biosecurity:
 1. Biological safety cabinet
- Introduction to biotechnology:
 1. safety in recombinant DNA technology
 2. viral vectors for gene transfer
 3. risk assessment for genetically modified organisms
- Chemical, Fire & electrical safety:
 1. Hazardous and explosive chemicals.
 2. Fire hazards.
 3. Electrical hazards.
 4. Ionizing radiation hazards.
 5. Noise hazards.
- The role or functions of clinical laboratories in a hospital
- Cost-containment practices and laboratory efficiency.
- General principles of specimen collection, transport and storage.
- Proper labeling and storage of all laboratory materials.
- Interaction with and education of clinicians and nurses for proper use of laboratory services and provisions of appropriate laboratory request forms.
- Introduction to the use of catalogues for ordering equipment and supplies.
- Calibration of instruments
- Ordering equipment and supplies using catalogues

Practical:

- Identification of lab safety tools and equipments.
- Methods of disinfection and decontamination
- Handling storage and use of chemical reagents.
- Microbial hazards and biohazard.
- First aid
- Use of analytical laboratory balances
- Use of laboratory glassware and volumetric vessels
- Aseptic technique
- Phlebotomy techniques, different types of blood samples and preparation of smear
- Centrifugation
- Dilution and dissolution
- Filtration and distillation

Evaluation: according to the general evaluation

References:

1. Laboratory Biosafety Manual 3rd edition, World Health Organization, Geneva, 2004.
2. World Health Organization. Principles and Management of Health Laboratories, WHO, Regional Office, Alexandria, 1993.
6. Murray et al. Manual of Clinical Microbiology. 8th ed. American Society for Microbiology, Washington, DC, ISBN: 1-55581-126-4.
2. 1. Monica Cheesbrough. District laboratory practice in tropical countries. 2nd edition. Cambridge university press. 2005.
3. 2. Douglas W. Clark. Basic laboratory skills for water and waste water analysis. New Mexico water research resources research institute. 1988.
4. 3. P. Parimoo. Pharmaceutical analysis. CBS publisher. 2010.

Course code: L-MIC212

Course Title: Microbiology I

Credit hour: 2+1

Course description:

The course assists the students to discuss classification of bacteria, methods of identification and diagnosis.

Objectives:

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

1. Discuss laboratory safety and organization of microbiology laboratory.
2. Enumerate methods of identification of bacteria.
3. Define diagnostic methods used in medical microbiology.
4. Classify microorganisms and the principle classification of bacteria of medical importance.

Contents:

1. Introduction to medical microbiology.
2. Safety and organization of the clinical bacteriology laboratory.
3. Structure and morphology of bacteria.
4. Classification of bacteria.
5. Bacterial metabolism, nutrition and growth.
6. Bacterial genetics.
7. Microscope and microscopic techniques used in microbiology.
8. Staining techniques.
9. Sterilization and disinfection.
10. Specimen collection.
11. Culture containers and media.

Practical:

- Microscopic identification of different types of bacteria
- Gram stain
- Incubator use in microbiological culture
- Sterilization and autoclave use
- Different types of microbiological specimens and its collection
- Culture media

Evaluation: according to the general evaluation methods.

References:

1. Richard V. Goering, Hazel M. Dockrell, Mark Zuckerman. Evan M, Roitt. Peter L. Chiodini. Mims' medical microbiology, 5th edition. Elsevier Saunders. 2013.
2. Frank E. Berkowitz, Robert C. Jerris. Practical medical microbiology. Wiley Blackwell. 2016.
3. Michael Ford. Medical microbiology. 2nd edition. Oxford university press. 2014.

4. Patrick R. Murray, Ken, S. Rosenthal, Michael A. Pfaller. Medical microbiology. 8th edition. Elsevier. 2016.
5. David Greenwood, Richard Slack, John Peutherer, Mike Barer. Medical microbiology. 7th edition. Churchill livingstone. 2007.
6. Karen C. Carroll, Geo. F. Brooks, Janet S. Butel, Stephen A. Morse, Timothy A. Mietzner. Medical microbiology. 26th edition. Mc Graw Hill. 2013.
7. M. Wilkins. Medical microbiology. Scion. 2011.

Course code: L-HEM213

Course Title: Haematology I

Credit hour: 2+1

Course description:

This course aims to provide the student with thorough theoretical knowledge of definition of haematology normal hemopoiesis, apparatus and equipments, and awarded about lab Safety, and to equip the student with the skills necessary to perform the relevant laboratory tests for the above mentioned abnormalities as well as the ability to interpret the results.

Objectives:

In this course the student is introduced to the basics of hematology with special emphasis on the laboratory aspects of the specialty. It starts with blood cell morphology and progresses all the way to the most advanced technical aspects of laboratory evaluation. It gradually correlates the theoretical knowledge of the student with the technical approach to diagnostic problems, the student should be able to:

- A- Definition of haematology
- B- Describe normal Haemopoiesis.
- C- Classify and describe abnormalities of red cells, white cells and platelets.
- D- Perform all routine tests in general hematology and interpret their results.

Contents:

- Normal Blood Cell Morphology.
- Normal Bone Marrow Aspiration and Biopsy Morphology

- Abnormalities of Red Blood cells, White Blood cells and Platelets.
- Laboratory Aspects of Anemia.
- Laboratory Aspects of Leukemia, Lymphomas and other hematological malignancies.
 - Normal Blood Cell Morphology.
 - Normal Bone Marrow Aspiration and Biopsy Morphology
 - Abnormalities of Red Blood cells, White Blood cells and Platelets.
 - Laboratory Aspects of Anemias.
 - Laboratory Aspects of Leukemias, Lymphomas and other hematological malignancies.

Practical:

Preparation of blood smear

Different types of blood samples.

Preservative, stains and its use.

Microscopic morphology of blood cells.

PCV and haematocrit centrifuges use.

Running Haemocytometer

Evaluation: according to the general evaluation methods.

References:

- 1- A. Victor. Hoffbrand, Paul A. H. Moss. Hoffbrand's Essential Haematology. 7th edition. Wiley Blackwell. 2016.
- 2- H. Thiel, H. Diem, T. Haeflrich. Color atlas of Hematology. 2nd edition. Thieme. 2004.
- 3- Andrew Blann, Gavin Knight, Gary Moore. Haematology. Oxford university press. 2010.
- 4- Ronald Hoffman, Edward J. Benz, Jr, Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi. Hematology Basic principles and practice. 6th edition. Elsevier Saunders. 2013.
- 5- Kenneth Kaushansky Marshall AlLichtman, Josef T. Prchal, Marcel M. Levi, Oliver W. Press. Linda J. Burns. Michael A. Caligiuri. Williams Hematology. McGraw Hill. 9th edition. 2015.

- 6- Andrew Blann, Nessar Ahmed. Blood science principle and pathology. Wiley Blackwell. 2014.
- 7- Bernadette F. Rodak, George A. Fritsma, Elaine M. Keohane. Hematology clinical principles and applications. 4th edition. Elsevier Saunders. 2012.
- 8- Betty Ciesla. Hematology in practice. E. A. Davis. 2007.

Course code: L-PAR214

Course Title: Parasitology I

Credit hour: 1+1

Course description:

The course planned to provide the students with current knowledge concerning the morphological features, distribution, life cycles, pathogenesis and pathology of parasites and technical skills of parasitological methods to enable him to recognize and diagnose their infections.

The parasitic diseases cause high morbidity rates in the endemic areas particularly in the Sudan, therefore the student should be coped with recent knowledge concerning diseases processed by them to contribute in their prevention and control.

Objectives

Understand the classification and distinguishing features of Protozoa and medical importance.

Understand the developmental cycle, transmission and pathology of parasites.

Understand all the parasitological techniques used for the diagnosis of protozoa.

Understand the classification and distinguishing features of Arthropods.

Understand the taxonomy and morphology of medically important protozoa.

Understand the development cycle, transmission and pathology of the following protozoa:-*Leishmania*, Trypanosomes, Malaria. *Entamoebahistolytica*, *Giardia lamblia*, *Trichomonasvaginalis*, Free living amoeba, *Balantidium coli*.

Apply all the parasitological techniques used for the diagnosis of the above parasites.

To know how to control some of the major diseases caused by protozoa.

Contents

Introduction to Medical Parasitology & protozoa.

Trypanosomes I.

Trypanosomes II.

Leishmania I.

Leishmania II.

Malaria I.

Malaria II.

Malaria III.

Toxoplasma gondii.

Isospora belli.

Entamoebahistolytica.

Balantidium coli & *Naegleira fowleri.*

Giardia Lamblia.

Trichomonas vaginalis.

Opportunistic protozoa.

Practical:

Microscopy

Stool examination and preparation of sample

Entamoebahistolytica and allies

Entamoeba coli and other intestinal amoeba

Free living ameobae

Giardia lamblia

Trichomonas vaginalis

Trypanosomiasis

Evaluation: according to the general evaluation methods.

References:

1. Robert Davidson, Andrew Brent, Anna Seale. Oxford handbook of tropical medicine. 4th edition. Oxford university press. 2014.
2. Ruth Leventhal, Russell F. Cheadle. Medical parasitology. 6th edition. F. A. Davis. 2012.
3. Monica Cheesebrough. District Laboratory Manual for Tropical Countries, Stephen Austin and Sons. 2006.
4. Sougata Ghosh. Paniker's textbook of medical Parasitology, 7th edition. Jaypee brothers. 2013.
5. David T. John. William A. Petri, Jr. Markell and Voge's medical parasitology. 9th edition. Elsevier Saunders. 2006.

Course code: L-CHP215

Course Title: Chemical pathology I

Credit hour: 2+1

Course description:

This course introduces the student to clinical chemistry its scope and importance, and to the clinical chemistry lab, understanding of the basic human biochemistry, and the basic terminologies and techniques used in chemical pathology laboratory.

Objectives

Describe basic human biochemistry.

List the biochemical lab hazards and precautions.

Define the chemical pathology terminology, units and role of clinical chemistry in medicine.

Prepare different types of reagents and perform the dilution technique.

Establish practical methods for carrying out quality control, develop criteria for judging the out-of-control condition, and provide a practical approach to solving an out-of-control condition.

Collect and preserve different types of specimens.

Study of instruments including colorimetry and spectrophotometry.

Study of renal function including urine chemical & physical properties.

Discuss the function and clinical significance of plasma proteins, the general causes of abnormal plasma protein concentrations.

Describe and compare methodologies used in the analysis of plasma total protein and albumin.

Identify safety precautions and ways of dealing with chemicals, specimens, and biohazards.

Explain basic laws including preparation of solutions, dilution techniques and finding out concentrations using qualitative and quantitative methods.

Identify reporting of results and convert it into old units to SI units.

Perform the collection of samples, types of anticoagulants and preservatives used in the lab.

Identify renal system including physical properties of urine (PH – specific gravity – odor – color), chemical properties of urine including detection of reducing substances – ketone bodies – urine protein – bile pigment.

Identify instrumentation including Colorimetry, spectrophotometry, their principle (Beer-Lambert law), parts of the instrument, and the difference between them.

Describe the deal with patient forms, co-patients, receiving and dispatching of results.

List the Liver functions, and their clinical significances.

List the types of serum proteins from the liver.

Discuss the general causes of abnormal serum protein concentrations.

List and compare the different methodologies used in an estimation of plasma total protein and albumin.

Explain the principles of tests for the separation or fractionation of the different plasma proteins.

Measure laboratory data, graph the data, determine significant constant or standard curve, and determine if there is a trend or a shift.

Identify the CHO metabolism and list different methods of blood glucose level estimation.

Contents

Renal physiology.

Urine formation.

Urine examination.

Carbohydrate metabolism I.

Carbohydrate metabolism II.

Carbohydrate disorders: types of hyperglycemia I.

Carbohydrate disorders: types of hypoglycemia II.

Diagnosis of Diabetes mellitus.

Plasma proteins I.

Plasma proteins II.

Plasma proteins III .

Body fluids I.

Body fluids II.

Body fluids III.

Practical;

- Identification & using of colorimeter & spectrophotometer
- Chemical examination of urine
- Chemical examination of CSF
- Determination of blood glucose plasma proteins

Evaluation: according to the general evaluation methods.

REFERENCES:

1. Michael L. Bishop, Edward P. Fody, Larry E. Schoeff. Clinical Chemistry Principles, techniques, Correlation. 7th edition. Lippincott Williams & Wilkins. 2012.
2. Carl A. Burtis. David E. Burns. Tietz Fundamentals of clinical chemistry and molecular diagnostics. 7th edition. Elsevier Saunders. 2015.
3. Williams J. Marshall, Stephen K. Bangert, Marta Lapsley. Clinical chemistry. 7th edition. Mosby Elsevier. 2012.
4. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly. Clinical biochemistry an illustrated colour text. 5th edition. Churchill livingstone. 2013.
5. Nessar Ahmed. Clinical biochemistry. Oxford university press. 2011.
6. J. Koolman, K. H. Roehm. Color atlas of biochemistry, 2 edition. Thieme. 2005.
7. Wendy Arneson. Jean Brickell. Clinical Chemistry A laboratory perspective. F.A. Davis. 2007

8. Joel D. Hubbard. A concise review of clinical laboratory science.
Williams & Wilkins. 1997.

Course code: L-HIS216

Course Title: Histopathology I

Credit hour: 2+1

Course description:

This course assists the students to be acquainted with the normal structure of body tissues and practice preparation and preservation of histopathological specimens. The course discusses the understanding of specimen handling and preparation of specimen.

OBJECTIVES:

Understanding the specimen handling, fixing and treatment.

Preparatory methods for tissues and cells, microtomy, manual and automatic tissue processing, types of microtomes and their uses, this entails the basic knowledge of:

Preparation of specimen.

Handling of specimen.

Labeling.

Selection.

Cytology and its value in diagnosis.

Contents

Introduction to Histopathology

Methods of preparation (Tissues & cell)

Fixation

Types of fixatives (their uses & effect)

Decalcification

Tissue processing.

Tissue processing.

Microtomy and section cutting.

Frozen and its related sections

Theory of stain.

Theory of stain.

Hematoxylin and Eosin.

Introduction to cytology.

Preparation and fixation of samples.

Routine and special stains in cytology.

Types of samples and methods of collection.

Practical;

- ☐ Identification & detection of stains , & fixatives types
- ☐ Identification & using of microtome & processors
- ☐ Sectioning
- ☐ Decalcification

Evaluation: according to general evaluation methods.

REFERENCES:

1. Derek C.Allen, R. Iain Cameron. Histopathology specimens: clinical, pathological and laboratory aspect. Springer. 2004
2. Ivan Damjanov. Atlas of histopathology. Jaypee brothers. 2012.
3. R.C. Curran. Colour atlas of histopathology. 4th edition. Oxford university press. 2000.
- 4- JC Segen. Dictionary of Histopathology.
- 5- David Lowe, James Underwood. Recent advances in histopathology. 2004.
- 5- Clara Milikowski, Irwin Berman. Color atlas basic histopathology. Appleton & Lange. 1997.
- 6- James A. Strauchen. Diagnostic histopathology of the bone marrow. 1996.

7- John D. Bancroft, *et al.* Theory and Practice of Histological Techniques. 2000.

Course code: L-MOL217

Course Title: Molecular biology and genetics

Credit hour: 2+1

Course description:

This course was designed to introduce the students to the basics of genetics and molecular biology.

Objectives:

Study the basic molecular biology, Study gene expression, and To study the principles behind different molecular biology techniques.

Contents:

Cell and nucleus.
Nucleic acids.
Chromosomes.
DNA replication.
Transcription and RNA modification.
Genetic code.
Mutation.
DNA isolation.
Restriction endonuclease enzymes.
Molecular markers.

Practical;

- DNA isolation
- Restriction endonuclease enzymes, probe & hybridization
- PCR
- DNA amplification & cloning
- Southern blotting
- Chromosomal analysis

Evaluation: according to the general evaluation methods.

References:

1. Brown. Gene Cloning and DNA Analysis, Blackwell. 2006
2. Young. Medical Genetics, Oxford. 2005.
3. Jorde. Medical Genetics, Elsevier. 2005.

Second year- semester 4

Course code: L-MIC221

Course Title: Microbiology II

Credit hour: 2+1

Course description:

This course is designed to provide the students with adequate theoretical knowledge in bacteriology and immunology and laboratory skills that are needed to identify pathogenic bacteria covered in this course for laboratory diagnoses of diseases they cause.

. This course is designed to provide the students with adequate theoretical knowledge in bacteriology and immunology and laboratory skills that are needed to identify pathogenic bacteria covered in this course for laboratory diagnoses of diseases they cause.

Objectives

Know the basic immunology and roles of bacteria in pathogenicity and methods of transmission, prevention, control and diagnosis of bacterial diseases .

.understand the basic immunology and Serological diagnosis of microbial diseases.

Understand the bacterial Infection, types of infection, mode of spread, epidemiology and lab diagnosis.

Understand the bacteriological testing of food, water, and milk

Contents:

- Introduction to immunology.

- Bacteria isolation and identification
- Gram stain
- Principles of bacterial culture and sensitivity
- Infection, types of infection, mode of spread, epidemiology.
- Principles of Immunity (natural and acquired immunity).
- Immune system (humoral and cellular immunity).
- Serological diagnosis of microbial diseases.
- Pathogenesis and methods of isolation and identification of bacteria
Including:
 - Staphylococcus spp,
 - Streptococcus spp.,
 - Neisseria,
 - Corynebacteria, Listeria and Erysipelothrix
 - Clostridia and bacillus
 - Shigella spp.,
 - E. coli, Klebsiella, Proteus
 - Pseudomonas
 - Vibrio,
 - Brucella,
 - Haemophilus,
 - Bordetella, Yersinia,
 - Pasteurella,

Practical:

Biochemical test

Catalase test

Coagulase test, Indole, Citrate utilization test

KIA, MacConkey, Blood agar

Gram positive microorganism

Salmonella spp

Shigella spp

Evaluation: according to the general evaluation methods.

References:

1. Richard V. Goering, Hazel M. Dockrell, Mark Zuckerman. Evan M, Roitt. Peter L. Chiodini. Mims' medical microbiology. 5th edition. Elsevier Saunders. 2013.
2. Frank E. Berkowitz, Robert C. Jerris. Practical medical microbiology. Wiley Blackwell. 2016.
3. Michael Ford. Medical microbiology. 2nd edition. Oxford university press. 2014.
4. Patrick R. Murray, Ken, S. Rosenthal, Michael A. Pfaller. Medical microbiology. 8th edition. Elsevier. 2016.
5. David Greenwood, Richard Slack, John Peutherer, Mike Barer. Medical microbiology. 7th edition. Churchill livingstone. 2007.
6. Karen C. Carroll, Geo. F. Brooks, Janet S. Butel, Stephen A. Morse, Timothy A. Mietzner. Medical microbiology. 26th edition. Mc Graw Hill. 2013.
7. M. Wilkins. Medical microbiology. Scion. 2011.

Course code: L-HEM222

Course Title: Haematology II

Credit hour: 2+1

Course description:

This course aims to provide the medical technology student with thorough theoretical knowledge about normal blood grouping and blood storage.

OBJECTIVES:

Lukaemia and white cells disorders

Describe the human blood group systems.

Explain how to evaluate blood donors.

Describe the serological tests carried out by the blood bank.

Describe the different blood products produced by the blood bank.

Perform all laboratory tests related to blood banking.

Contents

Leukemia I

leukemia II

leukemia III

leukaemia V

Blood Group Systems e.g., ABO, Rh, Kell, Duffy, Kid, MNSs, etc. Blood Group Antibodies and their role in transfusion reactions.

Selection and Screening of Blood donors. And blood products.

Blood grouping, Cross matching and Compatibility testing.

Serological investigation of the Auto-immune hemolytic anemias. Coomb's test,

Investigation and Laboratory evaluation of Hemolytic Transfusion reactions. Complications of blood transfusion.

Practical

White blood cell morphology

Cytochemical Stains

Non specific esterase, endoperoxidase

FAB classification and morphology of leukaemic cell (M0-M7)

Coomb's test

Evaluation:

according to the general evaluation methods.

REFERENCES

- 1- A. Victor. Hoffbrand, Paul A. H. Moss. Hoffbrand's Essential Haematology. 7th edition. Wiley Blackwell. 2016.
- 2- H. Thelml, H. Diem, T. Haferlach .Color atlas of Hematology. 2nd edition. Thieme. 2004.
- 3- Andrew Blann, Gavin Knight, Gary Moore. Haematology. Oxford university press. 2010.
- 4- Ronald Hoffman, Edward J. Benz, Jr, Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi. Hematology Basic principles and practice. 6th edition. Elsevier

- Saunders. 2013.
- 5- Kenneth Kaushansky Marshall AlLichtman, Josef T. Prchal, Marcel M. Levi, Oliver W. Press. Linda J. Burns. Michael A. Caligiuri. Williams Hematology. McGraw Hill. 9th edition. 2015.
 - 6- Andrew Blann, Nessar Ahmed. Blood science principle and pathology. Wiley Blackwell. 2014.
 - 7- Bernadette F. Rodak, George A. Fritsma, Elaine M. Keohane. Hematology clinical principles and applications. 4th edition. Elsevier Saunders. 2012.
 - 8- Betty Ciesla. Hematology in practice. E. A. Davis. 2007.

Course code: L-PAR223

Course Title: Parasitology II

Credit hour: 2+1

Course description:

This course is planned to provide the students with current knowledge concerning the morphological features, distribution, life cycles and pathology of parasites and technical skills of parasitological methods to enable them to recognize and diagnose their infections.

The protozoan and helminthic diseases cause high morbidity rates in the endemic areas particularly in the Sudan, therefore the student should be coped with recent knowledge concerning diseases processed by them to contribute in their prevention and control.

Objectives

Understand the classification and distinguishing features of helminths of medical importance.

Understand the developmental cycle, transmission and pathology parasites.

Understand all the parasitological techniques used for the diagnosis of parasites.

Understand the taxonomy and morphology of medically important of parasites.

Understand the developmental cycle, transmission, pathology and pathogenesis of the following:

Ascarislumbricoides, *Enterobiusvermicularis*, Visceral larva migrans, *Strongyloidesstercoralis*, Hook worms, *Ancylostomaduodenale*, *Necator Americans*, Cutaneous larva migrans, *Trichinellaspiralis*, *Trichuristrichiura*, *Wuchereriabancrofti*, *Brugiamalayiae*, *Mansonella*, *Onchocerca volvulus*, *Loa loa*, *Dracunculusmedinensis*, Intestinal cestode, Tissuecestodes.

Apply all the parasitological techniques used for the diagnosis of nematodes and cestodes.

Know how to control some of the major diseases caused by nematodes and cestodes.

Contents

Introduction to Helminthology & Nematodes I.

Introduction to Helminthology & Nematodes II.

Ascarislumbricoides.

Enterobiusvermicularis & Visceral larva migrans.

Trichinellaspiralis & *Trichuristrichiura*.

Hook worms.

Introduction to filarial worms

Wuchereriabancrofti

Brugiaspp and *Onchocerca volvulus*

Loa loa & *Dracunculusmedinensis*

Introduction to intestinal cestodes

Taenia species

Hydatid cyst

Hymenolepis nana & *Dipylidium caninum*

Diphyllobothrium latum

Practical

Preparation of fresh specimen

Detection of nematode parasites

Loa loa

Ascaris lumbricoide

Taenia spp preparation and examination

Trichuris trichiura

Wuchereria bancrofti

Evaluation: according to the general evaluation methods.

References:

1. Robert Davidson, Andrew Brent, Anna Seale. Oxford handbook of tropical medicine. 4th edition. Oxford university press. 2014.
2. Ruth Leventhal, Russell F. Cheadle. Medical parasitology. 6th edition. F. A. Davis. 2012.
3. Monica Cheesebrough. District Laboratory Manual for Tropical Countries, Stephen Austin and Sons. 2006.
4. Sougata Ghosh. Paniker's textbook of medical Parasitology, 7th edition. Jaypee brothers. 2013.
5. David T. John. William A. Petri, Jr. Markell and Voge's medical parasitology. 9th edition. Elsevier Saunders. 2006.

Course code: L-CHP224

Course Title: Chemical pathology II

Credit hour: 2+1

Course description:

The course discuss the normal physiology of each body systems and its disorders.

Objectives

Discuss the roles of assays used to assist in the diagnosis of diabetes including glucose measurements, the fasting glucose, two-hour prandial, and glucose tolerance test measurements.

Describe the processing of bilirubin by the liver, define jaundice and describe the various pathological states associated with jaundice.

List the non-protein nitrogenous substances in the plasma and recognize their relative concentrations. Recognize the major clinical conditions associated with increased and decreased levels of urea, creatinine, creatinine, uric acid and ammonia in the plasma, and discuss the commonly used methods for their determination in plasma and urine.

Explain lipid / lipoprotein physiology and metabolism, describe the clinical tests used to assess them including principles and procedures, relate the clinical significance of lipid and lipoprotein values in the assessment of coronary heart disease, and discuss the incidence and types of lipid and lipoprotein abnormalities.

Define enzyme, including physical composition and structure; classify enzymes according to the international union of Biochemistry; list the major kinetic parameters used to describe enzyme activity; and explain why the measurement of serum enzyme levels is clinically useful.

Describe the biosynthesis and excretion of the following non-protein nitrogenous substances: urea, creatinine, uric acid and ammonia.

Relate the level of protein in the diet, protein metabolism, and renal function to the plasma levels of urea.

Relate plasma levels of creatinine to diet, muscle mass and turnover, and renal function.

Relate plasma levels of uric acid to diet, purine metabolism, and renal disease; and relate the solubility of uric acid to the pathological consequences of increased plasma uric acid.

Discuss commonly used methods for the determination of creatinine, urea, uric acid, and ammonia in plasma and urine, and describe the specimen requirements and storage conditions.

Describe digestion, absorption and metabolism of cholesterol and triglycerides including the role of the liver and adipose tissue.

Describe the synthesis and catabolism of HDL, LDL, VLDL, and chylomicrons.

Discuss the risk factors for coronary heart disease.

State the clinical significance of hyperlipidemia.

Discuss the types of lipoproteinemias with respect to lipid and lipoprotein levels, appearance of the specimen and genetic etiology.

Understand the international union of biochemistry (IUB) classification of enzymes and why other names are used.

Discuss the different factors affecting the rate of an enzymatic reaction.

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

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

Contents:

Non-protein nitrogenous substances: Urea

Non-protein nitrogenous substances: Creatine & Creatinine

Non-protein nitrogenous substances: Ammonia & Uric acid

Electrolytes: Sodium metabolism, disorders and measurement

Electrolytes: K⁺ metabolism, disorders and measurement

Electrolytes: Calcium metabolism, disorders and measurement

Acid-base balance metabolism

Acid-base balance disorders

Water metabolism

Renal Physiology.

Renal disorders.

Practical;

- Determination of urea & creatinine
- Determination of serum uric acid plasma calcium
- Electrolytes measurement

Evaluation: according to the general evaluation methods.

References:

1. Michael L. Bishop, Edward P. Fody, Larry E. Schoeff. Clinical Chemistry Principles, techniques, Correlation. 7th edition. Lippincott Williams & Wilkins. 2012.
2. Carl A. Burtis. David E. Burns. Tietz Fundamentals of clinical chemistry and molecular diagnostics. 7th edition. Elsevier Saunders. 2015.
3. Williams J. Marshall, Stephen K. Bangert, Marta Lapsley. Clinical chemistry. 7th edition. Mosby Elsevier. 2012.
4. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly. Clinical biochemistry an illustrated colour text. 5th edition. Churchill livingstone. 2013.
5. Nessar Ahmed. Clinical biochemistry. Oxford university press. 2011.

6. J. Koolman, K. H. Roehm. Color atlas of biochemistry, 2 edition. Thieme. 2005.
7. Wendy Arneson. Jean Brickell. Clinical Chemistry A laboratory perspective. F.A. Davis. 2007
8. Joel D. Hubbard. A concise review of clinical laboratory science. Williams & Wilkins. 1997.

Course code: L-HIS225

Course Title: Histopathology II

Credit hour: 2+1

Course description:

The course discusses the understanding of special staining methodology, and preparation of stain.

OBJECTIVES:

- Understand routine and special method of tissue processing
- Understand diagnostic techniques
- Understand special staining methodology
- Have a good skills of special stain technique
- Know diagnostic application of special stains
- Have a good knowledge of:
Special stains, DNA techniques in histology, Carbohydrate & diseases
Diseases of accumulation & pigments, Connective tissue and its importance.

Contents:

Introduction to special stains

Nucleic acid & nucleoproteins

Nucleic acid & nucleoproteins

Carbohydrates (Classifications)

Carbohydrates (Glycogen)

Carbohydrates (Mucin)

Carbohydrates control methylation & saponification

Amyloid (classification)

Amyloid (method of demonstration)

Extracellular substance (fibrin & keratin)

Cytoplasmic granules

Introduction to connective tissues (CT)

CT classification

CT method of demonstrations

Lipid (classification)

Lipid staining

Practical;

- Performing special stains
- demonstrations of CT
- demonstrations of Amyloid
- demonstrations of mucin, lipids & glycogen

Evaluation: according to the general evaluation methods.

References:

1. Derek C. Allen, R. Iain Cameron. Histopathology specimens: clinical, pathological and laboratory aspect. Springer. 2004
2. Ivan Damjanov. Atlas of histopathology. Jaypee brothers. 2012.
3. R.C. Curran. Colour atlas of histopathology. 4th edition. Oxford university press. 2000.
- 4- JC Segen. Dictionary of Histopathology.
- 5- David Lowe, James Underwood. Recent advances in histopathology. 2004.

- 2- Clara Milikowski, Irwin Berman. Color atlas basic histopathology. Appleton & Lange. 1997.
- 3- James A. Strauchen. Diagnostic histopathology of the bone marrow. 1996.
- 4- John D. Bancroft, *et al.* Theory and Practice of Histological Techniques. 2000.

Course code: L-IMM226

Course Title: Immunology

Credit hour: 3+1

Course description:

In this course, the student will have the opportunity to gain basic knowledge required by a medical technologist in an immunology/serology laboratory.

Objectives:

1. Recognize the basic concepts of immunology.
2. Integrate scientific knowledge in immunological terms.
4. Study the structure and function of antigens and antibodies
5. Identify and classify the variable elements of the immune systems.
6. Recognize the contribution of each of the immune element in immunity.

Evaluation: according to the general evaluation methods.

Contents:

Introduction and overview to the immune system.
 Cells involved in the immune system.
 Natural immunity and immunological barriers.
 Acquired immunity and clonal selection.
 Lymphoid system and location of the immune cells.
 Immune cells surface receptors and their function.
 Cytokines network.
 T-lymphocytes production and maturation.
 T-lymphocytes surface receptors.
 B-lymphocytes production and maturation.
 B-lymphocytes surface receptors.
 Macrophages surface receptors.
 Natural killer cells functions and surface receptors.

Neutrophils, basophils, eosinophils, platelets surface receptors.

Cellular adhesion molecules.

Major histocompatibility molecules.)

Antigens and immunogens

B-lymphocytes activation and antibody production.

Immunoglobulin's structure.

Immunoglobulin's functions and receptors.

Immunoglobulin's diversities.

T and B-lymphocytes cooperation.

Antigen presenting cells.

Monoclonal antibodies.

Simple serological lab techniques.

Complex serological lab techniques.

1. The complement system.
2. Complement proteins and their receptors.
3. Regulation of the immune response.

Practical;

- Simple serological lab techniques.
- Complex serological lab techniques.
- Detection of complement activity
- Measurement of Igs.
- Detection of T-cell surface marks & activity
- Detection of tissue compatibility by immunological techniques

Evaluation: according to the general evaluation methods.

References:

1. Reeves. Lecture Notes on Immunology, Blackwell. 2000.
2. Ivan Roitt et al. Immunology, 6th edition. Mosby Elsevier. 2002.
3. Abbas, Lichtman, Pober. Cellular and molecular immunology. 5th edition. W.B. Saunders. 2005.
4. Janeway et al. Immunobiology-the immune system in health and disease, 6th edition, Garland science. 2005.
5. Coligan et al. eCurrent Protocols in Immunology. John Wiley & Sons, 1998.
6. Ivan Roitt, Jonathan Brostoff, David Male, David Roth. Immunology .7th edition .Mosby. 2006.
7. Ivan Roitt, Peter Delves. Roitt's. Essential Immunology. 10th edition. Wiley-Blackwell. 2011.

Course code: L-IST227/ L-IST327/ L-IST412/ L-IST422

Course Title: In-service training

Credit hour: 2+1

Course description:

This is a practical, field, hands on course, in which students will be assigned to different medical labs.

Objectives:

1. To train students in the real place where they are going to work in the future.
2. Students should gain practical skills and experience.

Contents(Pure practical):

1. Students will be distributed to different governmental and special medical service providing units and they will practice in these units under the supervision of their tutors according to the course they are studying.
2. The student will submit his log book at the end of the course.
3. The tutor will write a report concerning each student performance
4. Students will be distributed to different governmental and special medical service providing units and they will practice in these units under the supervision of their tutors according to the course they are studying.
5. The student will submit his log book at the end of the course.
6. The tutor will write a report concerning each student performance.

Third year- Semester five

Course code: L-MIC311

Course Title: Microbiology III

Credit hour: 2+1

Course description:

planned to provide the students the knowledge concerning the Basic, virology and mycology.

Objectives

Understand the basic virology and mycology and common viruses, fungi .basic virology and mycology.

Understand the roles of pathogenicity and methods of transmission, prevention , control and diagnosis of common viral and fungal diseases .

Contents:

- Introduction to fungi: morphology, structure,
- classification and general characteristics,
- growth requirements, isolation and identification
- Mycology Fungi that cause Superficial mycosis, subcutaneous mycosis, systemic mycosis, opportunistic mycosis
- Fungal toxins
- Laboratory Techniques in Mycology
- General virology: Introduction & history of virology.
- Structure of viruses ,classification, factors affect upon viruses, prevention of viral diseases Virus replication pathogenesis of viral infection ,
- Laboratory diagnosis of viral infections: a. Virus isolation & identification Antigen detection Nucleic acid detection Electron microscopy & immune electron microscopy serology
- Orthomyxoviruses, paramyxoviruses & Corona viruses.,
- Picornaviruses & Caliciviruses
- Reoviruses, Rhabdoviruses, Retroviruses,
- Toga- & Flaviviruses, Bunyaviruses, Arena- & Filoviruses,
- Parvoviruses & adenoviruses, Herpesviruses, Hepadnaviruses, Papovaviruses, Poxviruses,

Practical:

Fungal morphology and structure

Fungi staining

Virus culturing

DNA containing viruses

Living tissue culturing, Yolk sac culturing
RNA containing viruses

Evaluation: according to the general evaluation methods.

References:

1. Richard V. Goering, Hazel M. Dockrell, Mark Zuckerman. Evan M, Roitt. Peter L. Chiodini. Mims' medical microbiology. 5th edition. Elsevier Saunders. 2013.
2. Frank E. Berkowitz, Robert C. Jerris. Practical medical microbiology. Wiley Blackwell. 2016.
3. Michael Ford. Medical microbiology. 2nd edition. Oxford university press. 2014.
4. Patrick R. Murray, Ken, S. Rosenthal, Michael A. Pfaller. Medical microbiology. 8th edition. Elsevier. 2016.
5. David Greenwood, Richard Slack, John Peutherer, Mike Barer. Medical microbiology. 7th edition. Churchill livingstone. 2007.
6. Karen C. Carroll, Geo. F. Brooks, Janet S. Butel, Stephen A. Morse, Timothy A. Mietzner. Medical microbiology. 26th edition. Mc Graw Hill. 2013.
7. M. Wilkins. Medical microbiology. Scion. 2011.

Course code: L-HEM312

Course Title: Haematology III

Credit hour: 2+1

Course description:

This course is based on practical that aims to provide the student with the necessary knowledge and skills to plan and perform the necessary tests and procedures to investigate and diagnose anemia, leukemia, lymphomas and bleeding problems.

An important part of the course is the ability to recognize and manage common problems with machines, tests and stains.

OBJECTIVES:

- Classify and describe abnormalities of red cells, white cells and platelets.
- Perform all routine tests in general hematology and interpret their results.
- Identify the relevant automated processes.

- Describe and perform the quality control procedures in hematology laboratory.

Contents:

Blood Cell Morphology in Health & Disease:

Lectures on Investigation of Hemoglobinopathies:

Manual Blood Counting:

Special staining for difficult leukemia cases.

Erythrocyte Sedimentation Rate (ESR)

Computerization of the Hematology Laboratory.

Quality Control in Hematology

Practical:

RBCS morphology (size, shape, and haemoglobinization)

ESR

WBCS counting

RBCS counting

Platelets counting

Cell counter (Principle)

Automated haematology analyzer (different cell morphology

Evaluation: according to general evaluation methods.

REFERENCES

- 1- A. Victor. Hofflorand, Paul A. H. Moss. Hoffbrand's Essential Haematology. 7th edition. Wiley Blackwell. 2016.
- 2- H. Theml, H. Diem, T. Haferlach .Color atlas of Hematology. 2nd edition. Thieme. 2004.

- 3- Andrew Blann, Gavin Knight, Gary Moore. Haematology. Oxford university press. 2010.
- 4- Ronald Hoffman, Edward J. Benz, Jr, Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi. Hematology Basic principles and practice. 6th edition. Elsevier Saunders. 2013.
- 5- Kenneth Kaushansky Marshall AlLichtman, Josef T. Prchal, Marcel M. Levi, Oliver W. Press. Linda J. Burns. Michael A. Caligiuri. Williams Hematology. McGraw Hill. 9th edition. 2015.
- 6- Andrew Blann, Nessar Ahmed. Blood science principle and pathology. Wiley Blackwell. 2014.
- 7- Bernadette F. Rodak, George A. Fritsma, Elaine M. Keohane. Hematology clinical principles and applications. 4th edition. Elsevier Saunders. 2012.
- 8- Betty Ciesla. Hematology in practice. E. A. Davis. 2007.

Course code: L-PAR313

Course Title: Parasitology III

Credit hour: 2+1

Course description:

This course provides the students with knowledge of biology and biochemistry of helminthes and protozoal parasites and also gives the students a detailed description on the pathogenesis and pathological affect of human parasites with emphasis on promoting of parasitological technical skills.

Objectives:

Discuss morphology, life cycle and metabolism of parasites.

Perform laboratory diagnostic methods with emphasis on the major parasites in the Sudan.

Discuss the basic taxonomy of protozoa parasites.

Describe and perform the general morphology and ultra-structure of protozoa.

Outline the physiology of protozoa parasites.

Outline biochemistry and metabolism of protozoa parasites.

Discuss the pathology and medical features of free-living amoeba.

Identify the different species of amoeba by laboratory methods.

Discuss the life cycle, pathology and medical features of intestinal flagellate.

Identify the different species of intestinal flagellate by laboratory methods.

Discuss the life cycle of malaria parasites.

Discuss the changes in the blood due to malaria parasite.

Describe the diminished susceptibility to malaria.

Discuss the clinical features of malaria

Discuss the complication of malaria

Outline the management of falciparum malaria

Identify drug resistant malaria

Assess the drug resistant malaria

Advanced technique in malaria detection

Practical:

Microscopic examination of plasmodium parasites

Plasmodium species and stages

Intestinal flagellate

Free living Amoebae

Blood examination of parasites

Plasmodium spp

Prioplasma

Toxoplasma

Advanced techniques in malaria diagnosis

Evaluation: according to the general evaluation methods.

References:

1. Robert Davidson, Andrew Brent, Anna Seale. Oxford handbook of tropical medicine. 4th edition. Oxford university press. 2014.
2. Ruth Leventhal, Russell F. Cheadle. Medical parasitology. 6th edition. F. A. Davis. 2012.
3. Monica Cheesebrough. District Laboratory Manual for Tropical Countries, Stephen Austin and Sons. 2006.
4. Sougata Ghosh. Paniker's textbook of medical Parasitology, 7th edition. Jaypee brothers. 2013.
5. David T. John. William A. Petri, Jr. Markell and Voge's medical parasitology. 9th edition. Elsevier Saunders. 2006.

Course code: L-CHP314

Course Title: Chemical pathology III

Credit hour: 2+1

Course description:

The course provide the student with knowledge and understanding about enzyme structure, function, GIT, vitamin sand tumor markers.

Objectives:

Study and demonstrate clinical enzymology including hydrolase, amylase, nucleotidase, trypsin, and pepsin.

Demonstrate gastrointestinal function by doing analysis of pancreatic amylase, lipase, bicarbonate, xylose absorption, and occult blood.

Understand the role of vitamins and principles of it is estimation and classification.

Study of endocrine system functions, hormones methods of extraction from biological fluids.

Understand tumour markers and the principle of estimation with RIA

and modified method with ELISA.

Understand renal function and its abnormalities with its basic

investigation including blood urea, creatinine, tubular and glomerular function tests.

Understand inborn errors of metabolism and some examples with details.

Contents:

Vitamins: Water soluble vitamins.

Vitamins: Fat soluble vitamins.

Acid-base balance: Regulation of acid-base system.

Acid-base balance: type of buffering system.

Acid-base disorders: Metabolic disorders & respiratory disorders.

Inborn error of metabolism.

Instrumentation: Theory of absorptiometers.

Instrumentation: Nephelometry and turbidimetry.

Instrumentation: Electrochemistry.

Toxicology.

Therapeutic drug monitoring .

Automation: Steps of automation process.

Trace elements.

GIT & GIT disorders.

Practical;

- Determination of vitamins, & trace elements
- Atomic absorption technique

- Gas analyzer
- Demonstration of Nephelometry and turbidimetry
- Running automation

Evaluation: according to general evaluation methods.

References:

1. Michael L. Bishop, Edward P. Fody, Larry E. Schoeff. Clinical Chemistry Principles, techniques, Correlation. 7th edition. Lippincott Williams & Wilkins. 2012.
2. Carl A. Burtis. David E. Burns. Tietz Fundamentals of clinical chemistry and molecular diagnostics. 7th edition. Elsevier Saunders. 2015.
3. Williams J. Marshall, Stephen K. Bangert, Marta Lapsley. Clinical chemistry. 7th edition. Mosby Elsevier. 2012.
4. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly. Clinical biochemistry an illustrated colour text. 5th edition. Churchill livingstone. 2013.
5. Nessar Ahmed. Clinical biochemistry. Oxford university press. 2011.
6. J. Koolman, K. H. Roehm. Color atlas of biochemistry, 2 edition. Thieme. 2005.
7. Wendy Arneson. Jean Brickell. Clinical Chemistry A laboratory perspective. F.A. Davis. 2007
8. Joel D. Hubbard. A concise review of clinical laboratory science. Williams & Wilkins. 1997.

Course code: L-HIS315

Course Title: Histopathology III

Course description:

The course discuss the understanding of tissue specimen handling and preparation of specimen. The study of all special stains is provide student to understanding different type of techniques use in histopathology lab.

OBJECTIVES:

Be familiar with both manual & automatic tissue processing

Do all special stains

Treat tissue specimen from reception to stain

Have a knowledge of advanced technique

Contents

Pigments classification

Pigments Demonstration.

Pigments demonstration.

Demonstration of Micro organisms

Demonstration of Micro organisms

Anatomy and histology of Female genital tract.

Physiology of female genital tract

Physiology of female genital tract

Cytology of female genital tract.

Non epithelial cells of female genital tract.

Different aspects of F.G.T.

Iatrogenic changes of F.G.T.

Inflammation of F.G.T.

Inflammation of F.G.T.

Practical;

- Pigments Demonstration
- Demonstration of Micro organisms

Evaluation: according to general evaluation methods.

References:

1. Derek C.Allen, R. Iain Cameron. Histopathology specimens: clinical, pathological and laboratory aspect. Springer. 2004
2. Ivan Damjanov. Atlas of histopathology. Jaypee brothers. 2012.
3. R.C. Curran. Colour atlas of histopathology. 4th edition. Oxford university press. 2000.
- 4- JC Segen. Dictionary of Histopathology.
- 5- David Lowe, James Underwood. Recent advances in histopathology. 2004.
 - 2- Clara Milikowski, Irwin Berman. Color atlas basic histopathology. Appleton & Lange. 1997.
 - 3- James A. Strauchen. Diagnostic histopathology of the bone marrow. 1996.
 - 4- John D.Bancroft, *et al.* Theory and Practice of Histological Techniques. 2000.

Course code: L-PAT316

Course Title: General pathology

Credit hour: 2+1

Course description:

This course is designed to provide students with solid theoretical and practical knowledge of general pathology. The pathological changes which take place in tissues and biological fluids is crucial for laboratory technician to understand and appreciate the importance of principles of laboratory investigations

Objectives:

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

- ☐ Discuss the processes of inflammation, cell injury, circulatory disturbances and

tissue changes due to other pathological conditions.

- ☐ Discuss the process of carcinogenesis
- ☐ List causes of general diseases in human body.
- ☐ List changes occurs in body fluids and tissues due to general diseases

Contents

- ☐ Cell injury
- ☐ Inflammation
- ☐ Pigmentation disorders
- ☐ Adaptation to cell injury
- ☐ Amyloidosis
- ☐ Hemorrhage
- ☐ Congestion
- ☐ Thrombosis
- ☐ Oedema
- ☐ Shock
- ☐ Benign tumors
- ☐ Malignant tumors
- ☐ Metastasis
- ☐ Paraneoplastic syndrome
- ☐ Local & systemic effect of neoplasm
- ☐ Tumor markers
- ☐ Lab diagnosis of tumor

Practical;

- Macroscopic identification of inflammation, necrosis, hemorrhage, congestion, thrombus & tumors
- Microscopic identification of inflammation, necrosis, hemorrhage, congestion, & abnormal mitotic figure, & N/C ratio.

Evaluation: according to general evaluation methods.

References:

1. S. Schnider & Philip A, Szanta. Pathology board review series. 5th edition. 2014
2. Robinson & Cotran. Review of pathology series. 4th edition. 2012

Third year- semester six

Course code: L-MIC321

Course Title: MicrobiologyIV

Credit hour: 2+1

Course description:

This course provides the students with knowledge of biology and biochemistry of microorganisms and also gives the students a detailed description on the pathogenesis and pathological effect of human microorganisms with emphasize on promoting of technical skills.

Objectives:

Perform sterilization of various objects by different methods and demonstrate the ability to test the efficiency of these techniques.

Demonstrate the ability to prepare culture media for the isolation, preparation & identification of bacteria & Mycoplasma.

Perform different laboratory procedures for isolation and identification of various organisms from clinical specimen.

Demonstrate the ability to enumerate and type bacteria for epidemiological purposes.

Demonstrate the ability to perform in-vitro sensitivity test, perform quantitative assay of these substances in biological fluids.

Perform different serological tests.

Demonstrate an ability to identify fungi in the various clinical specimens.

Demonstrate an ability to identify viruses in various clinical specimens.

Demonstrate an ability to handle animals for diagnostic purposes & for preparing antiserum and vaccines.

fundamental molecular biology and molecular tests

Contents:

Immunology and Immunoserological methods.

Epidemiology including sources of infection and spread of diseases.

Pathogenesis, isolation and identification of various bacteria.

Bacterial sensitivity.

Food and water bacteriology.

Mycology of the most common fungi in Sudan including isolation and identification.

Virology, including methods of identification of some viruses of medical importance.

molecular diagnosis

Practical:

Virus identification I

Virus identification II

Immunological technique in microbial identification

Vaccination, Immunization and vaccine preparation

Bacterial culturing and sensitivity

Isolation and identification of some bacteria

Evaluation: according to general evaluation methods.

References:

1. Richard V. Goering, Hazel M. Dockrell, Mark Zuckerman. Evan M, Roitt. Peter L. Chiodini. Mims' medical microbiology. 5th edition. Elsevier Saunders. 2013.
2. Frank E. Berkowitz, Robert C. Jerris. Practical medical microbiology. Wiley Blackwell. 2016.
3. Michael Ford. Medical microbiology. 2nd edition. Oxford university press. 2014.
4. Patrick R. Murray, Ken, S. Rosenthal, Michael A. Pfaller. Medical microbiology.

8th edition. Elsevier. 2016.

5. David Greenwood, Richard Slack, John Peutherer, Mike Barer. Medical microbiology. 7th edition. Churchill livingstone. 2007.

6. Karen C. Carroll, Geo. F. Brooks, Janet S. Butel, Stephen A. Morse, Timothy A. Mietzner. Medical microbiology. 26th edition. Mc Graw Hill. 2013.

7. M. Wilkins. Medical microbiology. Scion. 2011.

Course code: L-HEM322

Course Title: Haematology IV

Credit hour: 2+1

Course description:

This is basically a practical course that aims to provide the student with the necessary knowledge and skills to plan and perform the necessary tests and procedures to investigate and diagnose coagulation and bleeding disorders plus all the techniques needed in the Blood Bank.

The course is designed to understand and perform all blood banking and coagulation tests and procedures.

OBJECTIVES:

Provide comprehensive knowledge on both theoretical and practical aspects of:-

1. Normal coagulation pathway and related diseases.
2. Thrombophilia and related tests.
3. Anticoagulant drugs and their laboratory monitoring.

CONTENTS:

Hemostasis.

Bleeding Disorders.

Thrombophilia.

Clotting Screen and Bleeding Time.

Platelet Function tests

The basic test done is called “Platelet aggregation studies”.

Principles of anticoagulation & Anticoagulation Clinics.

Basics of Blood Group Antigens.

Selection and Screening of Blood donors. Blood grouping, Cross matching and Compatibility testing.

lab safety and waste control

Practical:

Anticoagulant in haemostasis

Preparation of platelet poor plasma

PT, APTT

Fibrinogen, Thrombin time

Platelets count

Bleeding time

Clotting time

Platelet function test

Evaluation: according to general evaluation methods.

References:

- 1- A. Victor. Hofflorand, Paul A. H. Moss. Hoffbrand's Essential Haematology. 7th edition. Wiley Blackwell. 2016.
- 2- H. Thöml, H. Diem, T. Haeflrich .Color atlas of Hematology. 2nd edition. Thieme. 2004.
- 3- Andrew Blann, Gavin Knight, Gary Moore. Haematology. Oxford university press. 2010.

- 4- Ronald Hoffman, Edward J. Benz, Jr, Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi. Hematology Basic principles and practice. 6th edition. Elsevier Saunders. 2013.
- 5- Kenneth Kaushansky Marshall AlLichtman, Josef T. Prchal, Marcel M. Levi, Oliver W. Press. Linda J. Burns. Michael A. Caligiuri. Williams Hematology. McGraw Hill. 9th edition. 2015.
- 6- Andrew Blann, Nessar Ahmed. Blood science principle and pathology. Wiley Blackwell. 2014.
- 7- Bernadette F. Rodak, George A. Fritsma, Elaine M. Keohane. Hematology clinical principles and applications. 4th edition. Elsevier Saunders. 2012.
- 8- Betty Ciesla. Hematology in practice. E. A. Davis. 2007.

Course code: L-PAR323

Course Title: Parasitology IV

Credit hour: 2+1

Course description:

This course provides the students with knowledge of biology and biochemistry of helminthes and protozoal parasites and also gives the students a detailed description on the pathogenesis and pathological effect of human parasites with emphasis on promoting of parasitological technical skills.

Objectives

Discuss morphology, life cycle and metabolism of parasites.

- Perform laboratory diagnostic methods with emphasis on the major parasites in the Sudan.

Identify the stippling of infected erythrocytes.

Discuss life cycle, pathology and diagnosis of Babesia species.

Discuss the life cycle, clinical aspects of Toxoplasmosis includes (Acquire toxoplasmosis, congenital infection, Ocular involvement and toxoplasmosis in the immunocompromised host).

Discuss life cycle, pathology, clinical features and laboratory diagnosis of Trypanosomiasis.

Discuss the life cycle, pathology, clinical features and laboratory diagnosis of Leishmaniasis.

Discuss epidemiology and control of major protozoan parasites in Sudan

Discuss the basic taxonomy of helminthes parasites.

Describe and perform the general morphology and ultra structure of helminthes parasite.

27- Discuss life cycle, main medical manifestation and diagnosis of Taenia species.

Contents:

Protozoa I

Protozoa II

Protozoa III

Protozoa IV

Helminthology – Nematodes I

Helminthology – Nematodes II

Helminthology – Nematodes III

Helminthology – Nematodes IV

Helminthology – Cestodes I

Helminthology – Cestodes II

Helminthology – Cestodes III

Helminthology – Trematodes I

Helminthology – Trematodes II

Helminthology –Trematodes III

Zoonosis

Medical Entomology I

Medical Entomology II

Medical Entomology III

Immunological responses evoked by parasites

Evasion of the immunresponse

Mechanism of host damage & Host susceptibility

Epidemiology and distribution of parasitic infections

Immunopathogenic of parasite infection

Practical:

Medical entomology (macroscopic description)

Fasciola hepatica

Blood flukes

Schistosoma spp (I)

Schistosoma spp (II)

Echinococcus granulosus

Flat helminth

Trypanosoma

Evaluation: according to the general evaluation methods.

References:

1. Robert Davidson, Andrew Brent, Anna Seale. Oxford handbook of tropical medicine. 4th edition. Oxford university press. 2014.
2. Ruth Leventhal, Russell F. Cheadle. Medical parasitology. 6th edition. F. A. Davis. 2012.

3. Monica Cheesebrough. District Laboratory Manual for Tropical Countries, Stephen Austin and Sons. 2006.
4. Sougata Ghosh. Paniker's textbook of medical Parasitology, 7th edition. Jaypee brothers. 2013.
5. David T. John. William A. Petri, Jr. Markell and Voge's medical parasitology. 9th edition. Elsevier Saunders. 2006.

Course code: L-CHP324

Course Title: Chemical pathology IV

Credit hour: 2+1

Course description:

The course discuss body systems and its disorders. The study of different profiles and how to interpret it to diagnose certain disorders.

Objectives:

- Deal with different laboratory organization roles.
- Perform different biochemical analysis in different specimens.
- Demonstrate and understand the metabolism of CHO, lipids, proteins, calcium, phosphorous, Na⁺, K⁺, and understand acid-base balance.
- Demonstrate and understand of the theory and application of instruments including electrophoresis, chromatography, spectroscopy and flame photometry.
- Understand the theory and application of quality control and statistics in chemical pathology lab.
- Follow the different basics of laboratory organization including safety precautions, ideal preparation of chemicals and reagents, instrument requirements, and universal terms for the ideal laboratory establishment.
- Understand principles of analysis of different analytes, acid-base regulation, respiratory acidosis and alkalosis, compensatory mechanism, pH, pO₂, and pCO₂.
- Understand calcium and phosphorous metabolism, composition of

bones, alkaline phosphatase, and perform analysis for Ca^{++} and P in serum and urine.

- Understand lipid metabolism and classification of lipo-proteins, measurement of free fatty acids with ultracentrifugation and micronephlometry .
- Understand and demonstrate the use of electrophoresis in assessment of plasma protein, principles of chromatography, types and methods of separation of sugars and amino acids, principles of spectroscopy and problems of spectrophotometers and differentiation of various ...
- Perform practical quality control programs including mathematical QC with charts, use of control sera in replicate duplicate, and reanalysis in the samples batches.

Contents:

Carbohydrate metabolism & disorders.

Regulation of carbohydrates metabolism.

Types of CHO disorders.

Laboratory diagnosis and monitoring.

Liver anatomy & physiology.

Liver disorders.

Liver function tests.

Bilirubin and biliary tract.

Types of jaundice & laboratory diagnosis.

Renal anatomy & Renal functions.

Non-proteinous nitrogenous compounds.

Water and sodium metabolism.

Electrolytes (potassium and bone minerals).

Renal disorders: Glomerular and tubular disorders.

Renal function tests: Glomerular function tests and tubular function tests.

Practical;

- Plasma bilirubin & liver function test
- Electrolytes & renal function test
- Measurement of body fluid osmolality

Evaluation: according to the general evaluation methods.

References:

1. Michael L. Bishop, Edward P. Fody, Larry E. Schoeff. Clinical Chemistry Principles, techniques, Correlation. 7th edition. Lippincott Williams & Wilkins. 2012.
2. Carl A. Burtis, David E. Burns. Tietz Fundamentals of clinical chemistry and molecular diagnostics. 7th edition. Elsevier Saunders. 2015.
3. Williams J. Marshall, Stephen K. Bangert, Marta Lapsley. Clinical chemistry. 7th edition. Mosby Elsevier. 2012.
4. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly. Clinical biochemistry an illustrated colour text. 5th edition. Churchill livingstone. 2013.
5. Nessar Ahmed. Clinical biochemistry. Oxford university press. 2011.
6. J. Koolman, K. H. Roehm. Color atlas of biochemistry, 2 edition. Thieme. 2005.
7. Wendy Arneson. Jean Brickell. Clinical Chemistry A laboratory perspective. F.A. Davis. 2007
8. Joel D. Hubbard. A concise review of clinical laboratory science. Williams & Wilkins. 1997.

Course code: L-HIS325

Course Title: Histopathology IV

Credit hour: 2+1

Course description:

The course discuss the understanding of specimen handling and preparation of specimen. The study of Histotechnology is provide student to understanding different type of techniques use in histopathology lab.

Objectives:

Understanding the specimen handling, fixing and treatment.
Preparatory methods for tissues and cells
,Microtomy.
Manual and automatic tissue processing.
Types microtomes and their uses, this entails the basic knowledge of:
Preparation of specimen.
Handling of specimen.
Labeling.
Selection.
Cytology and it is value in diagnosis

Contents:

Immunocytochemistry (introduction)
Immunocytochemical methods
Unmasking of antigen
Detection of low level antigens
Immunocytochemistry in practice (choice of technique)
Practical aspect of Immunocytochemical staining
Immunoperoxidase methods

Immunocytochemical staining techniques

Immunocytochemistry in diagnostic pathology (introduction)

Tissue specific markers

Basement membrane components

Leukocytes antigens and leukocyte specific Abs

Leukocytes antigens

Exfoliated cells of non-gynecological tissues

Practical;

- In situ hybridization technique
- Immunocytochemical staining techniques
- Practical aspect of Immunocytochemical staining
- Immunoperoxidase methods

Evaluation:

According to general evaluation methods.

References:

1. Derek C.Allen, R. Iain Cameron. Histopathology specimens: clinical, pathological and laboratory aspect. Springer. 2004
2. Ivan Damjanov. Atlas of histopathology. Jaypee brothers. 2012.
3. R.C. Curran. Colour atlas of histopathology. 4th edition. Oxford university press. 2000.
- 4- JC Segen. Dictionary of Histopathology.
- 5- David Lowe, James Underwood. Recent advances in histopathology. 2004.
- 5- Berman. Color Atlas of Basic Histology. McGraw-Hill. 2003

Course code: L-LMQ326

Course Title: Lab management and quality control

Credit hour: 2+0

Course description:

This course provides the students with the basic management skills needed in the clinical laboratory and assists the medical laboratory students to understand: Quality Control, its role and its importance. Accuracy, Reliability, Precision Internal and external quality control measure.

Objectives:

1. Explain the principles and solve problems concerning the organization and administration of clinical laboratories
2. Solve difficulties related to purchasing, personnel, data processing, fiscal management, budget development, quality assurance and legal aspects
3. Understand the function of the laboratory equipment and maintenance
4. Illustrate human resource management, physical structure and design of laboratories,
5. Design laboratory and safety codes, purchasing and inventory control,
6. Plan for budget development, quality assurance, laboratory organization, health, laboratory information management systems, and policies
7. Illustrate the importance of providing accurate and precise results for the patient's specimen.
8. Identify the type of errors encountered in the clinical lab from the point of patient preparation, sample collection, sample analysis and post sample analysis from the point of view of variables that may affect the result.
9. Apply the internal and external QA, QC materials, L-J charts, Qusum, Patient samples as QC, Moving averages

Contents (theory):

1. Introduction: role of the medical lab.
2. Organization and management.
3. Setting goals and objectives.
4. Facilities.
5. Special environment and safety.
6. Purchasing and product specification.
7. Inventory control and ordering system.
8. Human resources.

9. Financial management.
10. Decision making.
11. Information management.
12. Communication.
13. Personality and leadership quality.
14. Q.C (Definition & Basic Concept)
15. Q.C (Pre-analytical)
16. Q.C (Analytical Precautions)
17. Q.C (Method Evaluation)
18. Q.C (Precision & Accuracy)

Evaluation: According to general evaluation methods.

References:

1. Monica Cheesebrough. District Laboratory Manual for Tropical Countries, Stephen Austin and Sons. 2006.

Fourth year- semester 7

Course code: L-AMI411

Course Title: Advanced Microbiology

Credit hour: 5+3

Course description:

This course assist the student to discuss the important infections caused by bacteria, fungi and viruses, their etiologic agents in the different body systems ,and how to diagnose isolate and report these infections and advanced techniques in microbiological filed.

Objectives:

1. Describe and name the common organisms associated with different body system.

2. Define and acquire the ability to identify the different pathogenic fungi & viruses.
3. Apply the various diagnostic techniques for isolation and identification of viruses and fungi

Contents:

1. Bacteriology of water and milk.
2. Preservation of stock cultures.
3. Automation.
4. Laboratory animals.
5. Sterile body fluids and effusions.
6. Quality control in microbiology.
7. Bacterial vaccines.
8. Anaerobic bacteria.

Practical:

Microbial examination of water and milk

CSF examination

Blood culturing

Automated bacterial culture and sensitivity

Microbial vaccines

Evaluation: according to the general evaluation methods.

References:

1. Patrick R. Murray, Ken, S. Rosenthal, Michael A. Pfaller. Medical microbiology. 8th edition. Elsevier. 2016.
2. Richard V. Goering, Hazel M. Dockrell, Mark Zuckerman. Evan M, Roitt. Peter L. Chiodini. Mims' medical microbiology. 5th edition. Elsevier Saunders. 2013.
3. Frank E. Berkowitz, Robert C. Jerris. Practical medical microbiology. Wiley Blackwell. 2016.
4. Michael Ford. Medical microbiology. 2nd edition. Oxford university press. 2014.
5. David Greenwood, Richard Slack, John Peutherer, Mike Barer. Medical microbiology. 7th edition. Churchill livingstone. 2007.
6. Karen C. Carroll, Geo. F. Brooks, Janet S. Butel, Stephen A. Morse, Timothy A. Mietzner. Medical microbiology. 26th edition. Mc Graw Hill. 2013.
7. M. Wilkins. Medical microbiology. Scion. 2011.

Course code: L-AHE411

Course Title: Advanced haematology

Credit hour: 5+3

Course description:

This course is designed to equip graduates with the knowledge and skills to competently undertake haematological investigations. A series of problem solving exercises examine the clinical presentation and laboratory investigation of a range of common blood dyscrasias. These include anaemia, acute and chronic leukaemia and both acquired and inherited disorders of haemostasis and coagulation as well as serology. In addition, the haematological changes seen in patients with systemic disorders are discussed. A sound knowledge of the haematology profile of individuals from the general population is required in order to recognize abnormal results. Less common blood disorders and some of the more complex investigations and issues in haematology will also be covered.

Contents:

Stem Cell Disorders of RBCs; Part 1
Stem Cell Disorders; Part 2
Stem Cell Disorders; Part 3
Heme Disorders Part 1
Heme Disorders Part 2
Globin Chain Disorders; Part 1
Globin Chain Disorders; Part 2
Globin Chain Disorders; Part 3
Globin Chain Disorders; Part 4
Globin Chain Disorders; Part 5
DNA Disorders; Part 1
DNA Disorders; Part 2
Survival Disorders; Part 1
Survival Disorders; Part 2
Survival Disorders; Part 3
WBC Disorders; Part 1
WBC Disorders; Part 2
WBC Disorders; Part 3
Intro. to Leukemias and Cytochem. Stains; Part 1
Intro. to Leukemias and Cytochem. Stains; Part 2
Chronic Myeloid Leukemias; Part 1
Chronic Myeloid Leukemias; Part 2
Chronic Myeloid Leukemias; Part 3
Acute Myeloid Leukemias; Part 1
Acute Myeloid Leukemias
Lymphocyte Maturation and Structure: Lymphocyte Nonmalignant Disorders; Part 1
Lymphocyte Nonmalignant Disorders; Part 2
Lymphocyte Nonmalignant Disorders; Part 3
Lymphocytic Leukemias; Part 1
Lymphocytic Leukemias; Part 2
Lymphomas

Practical:

Evaluation: according to the general evaluation methods.

References:

1. A. Victor Hoffbrand, Daniel Catovsky, Edward G. D. Tuddenham. Postgraduate haematology. 6th edition. Blackwell. 2011.
2. Denise O'shaughnessy, Michael Makris, David Lillicrap. Practical hemostasis and thrombosis. Blackwell. 2005.
3. A. Victor. Hoffbrand, Paul A. H. Moss. Hoffbrand's Essential Haematology. 7th edition. Wiley Blackwell. 2016.
4. H. Thöml, H. Diem, T. Haeflisch. Color atlas of Hematology. 2nd edition. Thieme. 2004.
5. Andrew Blann, Gavin Knight, Gary Moore. Haematology. Oxford university press. 2010.
6. Ronald Hoffman, Edward J. Benz, Jr, Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi. Hematology Basic principles and practice. 6th edition. Elsevier Saunders. 2013.
7. Kenneth Kaushansky Marshall AlLichtman, Josef T. Prchal, Marcel M. Levi, Oliver W. Press. Linda J. Burns. Michael A. Caligiuri. Williams Hematology. McGraw Hill. 9th edition. 2015.
8. Andrew Blann, Nessar Ahmed. Blood science principle and pathology. Wiley Blackwell. 2014.
9. Bernadette F. Rodak, George A. Fritsma, Elaine M. Keohane. Hematology clinical principles and applications. 4th edition. Elsevier Saunders. 2012.
10. Betty Ciesla. Hematology in practice. E. A. Davis. 2007.

Course code: L-APA411

Course Title: Advanced parasitology

Credit hour: 5+3

Course description:

This course assist the student to practice basic and advanced techniques applied for the diagnosis of parasitic infections.

Objectives:

1. Acquire adequate knowledge about the pathology, epidemiology,
2. diagnosis, and control of parasitic infections.
3. Practice basic and advanced techniques applied for the diagnosis of parasitic infections.
4. Present and introduce seminars in topics related to medical parasitology.

Contents:

1. Host parasite relationship.

2. Microscopy.
3. Fluorescence & electron microscope.
4. Coprological examination I.
5. Collection ,concentration and shipment.
6. Coprological examination II temporary and permanent stain for fecal smear.
7. Coprological examination I ,collection ,concentration and shipment.
8. Hematological examination of protozoa.
9. Culture technique I.
10. Culture technique II.
11. Cryopreservation.
12. Typing and banking of parasites.
13. Histological identification of parasites.
14. Animal inoculation.
15. Recovery of parasites from aspirates, biopsies and tissues.
16. Recovery of parasites from environmental subjects.
17. Relevance of radiology in the diagnosis of parasitic infections.
18. Value of research in understanding medical parasitology.
19. Epidemiological methods.
20. Malaria I: pathology and pathogenicity.
21. Malaria II: Epidemiology and Chemotherapy.
22. Visceral Leishmaniasis pathology and pathogenicity,.
23. Trypanosomiasis pathology and pathogenicity.
24. Toxoplasmosis.
25. Coccidian diarrhea.
26. Schistosomiasis.
27. Intestinal worms.
28. Nosocomial and laboratory acquired parasitic infection.

Practical:

Hatching egg technique

Culture technique

Leishmaniasis

Intestinal worm

Advanced malaria technique detection

Advanced parasite techniques

Evaluation: according to the general evaluation methods.

References:

1. Robert Davidson, Andrew Brent, Anna Seale. Oxford handbook of tropical medicine. 4th edition. Oxford university press. 2014.

2. Ruth Leventhal, Russell F. Cheadle. Medical parasitology. 6th edition. F. A. Davis. 2012.
3. Monica Cheesebrough. District Laboratory Manual for Tropical Countries, Stephen Austin and Sons. 2006.
4. Sougata Ghosh. Paniker's textbook of medical Parasitology, 7th edition. Jaypee brothers. 2013.
5. David T. John. William A. Petri, Jr. Markell and Voge's medical parasitology. 9th edition. Elsevier Saunders. 2006.
6. Fleck. S.L, Moody.A.H. Diagnostic technique in Medical Parasitology. 11th edition. ELBS,with Butterworth-Heinemann, 1993.
7. Peters. W and Gilles H.M. Color Atlas of Tropical Medicine and Parasitology. 4th edition. London, Mosby Wolfe. 1995.
8. Bell. D. R. Lecture notes on Tropical medicine. 4th edition. Blackwell. 1995.
9. Gillespie SH, Hawkey PM. Medical parasitology; a practical approach. Oxford. 1995.

Course code: L-ACH411

Course Title: Advanced chemical pathology

Credit hour: 5+3

Course description:

This course enables the student to master advanced clinical chemistry techniques as a final course in this specialty together with quality control in the clinical chemistry lab .

Objectives:

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

- Do biochemical analysis in different specimens.
- Demonstrate an ability to analyze, Hormones, and vitamins.
- Demonstrate an understanding of the metabolism of lipids.
- Demonstrate an understanding of the theory and application of instruments including electrophoresis, chromatography, spectroscopy and flame photometry.
- Understand theory and application of quality control and statistics in the Chemical Pathology lab.

Contents:

1. Lipids: disorders of lipids, metabolism, classification of lipo-proteins, measurement of

- free fatty acids, ultracentrifugation, micronephelometry.
- 2. Vitamins: role of vitamins and principles of radio immuno-assay, applications in clinical chemistry.
- 3. Endocrinology: endocrine system functions, hormones, methods of extraction from biological fluids.
- 4. Toxicology.
- 5. Instrumentations: electrophoresis and assessment of plasma proteins.
- 6. Chromatography: principle, types, methods of separation of sugars and amino-acids.
- 7. Spectroscopy.
- 8. Quality control.

Practical;

- ☐ electrophoresis and of plasma proteins
- ☐ separation of sugars and amino-acids using Chromatography technique
- ☐ Spectroscopy.
- ☐ Measurement of hormones, & drugs in biological fluids using ELIZA & radio immuno-assay

Evaluation: according to the general evaluation methods.

References:

1. Carl A. Burtis, David E. Burns, Tietz Fundamentals of clinical chemistry and molecular diagnostics. 7th edition. Elsevier Saunders. 2015.
2. Michael L. Bishop, Edward P. Fody, Larry E. Schoeff. Clinical Chemistry Principles, techniques, Correlation. 7th edition. Lippincott Williams & Wilkins. 2012.
3. Williams J. Marshall, Stephen K. Bangert, Marta Lapsley. Clinical chemistry. 7th edition. Mosby Elsevier. 2012.
4. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly. Clinical biochemistry an illustrated colour text. 5th edition. Churchill livingstone. 2013.
5. Nessar Ahmed. Clinical biochemistry. Oxford university press. 2011.
6. J. Koolman, K. H. Roehm. Color atlas of biochemistry, 2 edition. Thieme. 2005.

7. Wendy Arneson. Jean Brickell. Clinical Chemistry A laboratory perspective. F.A. Davis. 2007

8. Joel D. Hubbard. A concise review of clinical laboratory science. Williams & Wilkins. 1997.

Course code: L-AHI411

Course Title: Advanced histopathology

Credit hour: 5+3

Course description:

The course focus on advanced technique in the field of cytology, cytopathology, and histopathology, develop the ability to solve complex clinical (and research, when applicable) problems by applying sound knowledge of basic principles without the requirement always to rely on 'pattern matching', and understand importance of integration of clinical and pathological data for accurate diagnosis

Objectives:

- ☐ Compare methods and apply the principles of tissue fixation, processing, embedding and section cutting to practical situations encountered in a medical histopathology laboratory. Evaluate mainstream methods and explain when and why deviations from standard processes are necessary.
- ☐ Discuss the theory and practice of the H&E staining protocol and its role in histology laboratories. Show a systematic and enquiry based approach to investigation of staining variation. Develop familiarity and a working knowledge of other frequently requested 'special stains'. In this context, compare similar staining methods and methods to optimize stains.
- ☐ Discuss the practical principles and the theoretical basis for immunohistochemistry (IHC) in the context of the automated equipment commonly used for IHC testing. Evaluate how these techniques are used as tools for tumour diagnosis.
- ☐ Using IHC and tumour diagnosis as a base, investigate the use of slide based technologies compatible with the host laboratory. For example, demonstration of infectious agents in tissues, localization of specific genes (in situ hybridization) and various fluorescent microscopy and enzyme histochemistry application.
- ☐ Apply quality assurance and workplace safety procedures in the histology laboratory. Appreciate the need for ethically and culturally competent practice in the workplace

Contents:

Pathological basis of disease
Molecular technique
Fundamentals of databases and bioinformatics
Advanced Systemic pathology
New technologies in cervical screening
Squamous carcinoma and adenocarcinoma
Dyskaryosis

Management of women with cervical smear abnormalities

Practical;

- ☐ Molecular techniques in histopathology
- ☐ fluorescent microscopy
- ☐ enzyme histochemistry application in histopathology

Evaluation: according to the general evaluation methods.

References:

1. Kieman JA. Histological and Histochemical Methods. 4th Edition. 2008.
2. Buchwalow, Igor and Boecker, Werner. Immunocytochemistry: Basics and Methods. Springer. 2010.
3. Bancroft and Gamble. Theory and Practice of Histological Techniques. 6th edition. Elsevier. 2008.
4. Derek C. Allen, R. Iain Cameron. Histopathology specimens: clinical, pathological and laboratory aspect. Springer. 2004
5. Ivan Damjanov. Atlas of histopathology. Jaypee brothers. 2012.
6. R.C. Curran. Colour atlas of histopathology. 4th edition. Oxford university press. 2000.
- 7- David Lowe, James Underwood. Recent advances in histopathology. 2004.
- 6- Berman. Color Atlas of Basic Histology. McGraw-Hill. 2003

Course code: L-REM413

Course Title: Research methodology

Credit hour: 3+0

Course description:

The course prepares the student for scientific writing of researches, research proposal, articles, and abstracts, and create the research aspect in the graduate students.

General Objectives:

By the end of this course medical laboratory students will be able to write and develop research proposal.

Contents (theory):

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

Evaluation: according to the general evaluation methods.

Course code: L-BST414

Course Title: Biostatistics

Credit hour: 2+0

Course description:

This course is designed to include the study of important statistical methods such as meaning and use of measures of location and dispersion, correlation and regression and procedures for hypothesis testing so that the students will be able to understand their relevance to disease investigation as well as their role in biomedical research.

OBJECTIVES:

To introduce the students to the general understanding of the various aspects of basic biostatistics.

CONTENTS (theory):

- Measurements of Central Tendency:
“Mean, Median, Mode, Range and Standard Deviation”
- Descriptive Statistics:
“Rates, Ratio, Proportion and indices”
- Statistical Methods used in Epidemiology:
“Testing for significance, Chi-square, pair analysis”
- Methods for organizing epidemiologic data “Variables, Sex, Age, Ethnic group etc.”
- Basic probability:
 - Definition.
 - Random experiment.
 - Event space.
 - Probability Axioms.
 - Conditional probability.
 - Independence.
- T. Test.
- Methods of presentation:
“Tables, Graphs and Charts”.
- Types of samples and sampling techniques “Sample size, Types of sampling”.
- Introduction to research methodology.
- Data and variables.

References

1- W. M. Castle .Statistics in Small Doses. Churchill Livingstone.

Course code: L-THE415

Course Title: Thesis

Credit hour:0+3

General Objectives:

By the end of this course medical laboratory students will be able conduct small research project.

Contents:

1. Data collection.
2. Data processing
3. Data interpretation
4. Research report writing
5. Writing scientific paper
6. **Evaluation:** according to the general evaluation methods.

Course code: L-ALT423

Course Title: Advanced laboratory techniques

Credit hour: 2+1

Course description:

This course enable the student to Performd the different cytochemical staining procedures: Sudan Black, Myleloperoxidase, specific and non-specificesterases, acid phosphatase. PAS and iron staining, the different immunophenotyping method used to identify WBCs sub-population according to their expressing CDs markers.

As well as a working knowledge of the principle and practice of flowcytometry and interpretation of the clinical significance of common leukocyte immunophenotypes.

Familiarisation with cytogenetics, understanding the principles of cytogenetics and appreciating the relevance and significance of chromosomes in diagnostic hematology, interpreting the results of chromosome preparation of hemopoietic cells. In addition to understanding the principals involved in the molecular diagnosis of hematological disorders.

Objectives:

3. Performance of cytochemical staining procedures: Sudan Black, Myleloperoxidase, specific and nonspecificesterases, acid phosphatase. PAS and iron staining.
1. Study the different immunophenotyping method used to identify WBCs sub-population according to their expressing CDs markers.
2. Study the principle and practice of flowcytometry and interpretation of the clinical significance of common leukocyte immunophenotypes.
4. Study the cytogenetics, understanding the principles of cytogenetics and appreciating the relevance and significance of chromosomes in diagnostic hematology, interpreting the results of chromosome preparation of hemopoietic cells.
1. Study the principles involved in the molecular diagnosis of hematological disorders:

Contents:

1. Erythrocyte cytochemistry
2. Leukocyte cytochemistry
3. Immunophenotyping methods
4. Immunophenotyping of haematologic disorders
5. Flowcytometry principle and components
6. Flowcytometry protocol
7. Cytogenetic: basic issues
8. Cytogenetic abnormalaties in haematologic disorders
9. Molecular haematology
10. Diagnostic radioisotopes in Hematology

Practical:

PCR technique preparation

Cytochemistry

Histochemistry

Flowcytometry

Tissue culturing and tissue typing
Advanced blood banking
Automated blood culturing and sensitivity

Evaluation: according to the general evaluation methods.

References:

1. A.V.Hoffbran. Essential Haematology, 6th edition, Blackwell. 2014
2. Dacie and Lewis. Practical Haematology, 11th Edition, Elsevier. 2012
3. Carl A. Burtis. David E. Burns. Tietz Fundamentals of clinical chemistry and molecular diagnostics. 7th edition. Elsevier Saunders. 2015.
4. A. Victor. Hofflorand, Paul A. H. Moss. Hoffbrand's Essential Haematology. 7th edition. Wiley Blackwell. 2016.
5. Buchwalow, Igor and Boecker, Werner. Immunochemistry: Basics and Methods. Springer. 2010.

ملحق بتفاصيل القاعات والمعامل:
القاعات الدراسية:

- القاعة رقم 1 (سعتها عدد) 116 (طالب).
- القاعة رقم 2 (سعتها عدد) 80 (طالب).
- القاعة رقم 3 (سعتها عدد) 116 (طالب).
- القاعة رقم 4 (سعتها عدد) 126 (طالب).
- القاعة رقم 5 (سعتها عدد) 80 (طالب).
- القاعة رقم 6 (سعتها عدد) 50 (طالب).

المعامل:

- معمل الكيمياء الحيوية والكيمياء الكلينكية يتسع ل 40 طالب.
- معمل الحياء الدوائية والطبليات يتسع ل 70 طالب.
- معمل الدم والنسجة المرضية يتسع ل 50 طالب.
- معمل المهارات يتسع ل 40 طالب.
- المشرفة تتسع ل 40 طالب.
- المتحف يتسع ل 30 طالب.
- معمل الحاسوب وبه ثلاثة اقسام كل قسم به 22 جهاز.

