# Study plan for Medical Laboratories Dept.

## Level (1)

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<tr>
<th>Course Symbol</th>
<th>Course</th>
<th>Credit Hours</th>
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**Total Credits:** 18

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**Total Credits:** 18

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**Total Credits:** 16

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**Total Credits:** 16
Course symbol: BIOL-107  
Course Title: Human Biology  
Prerequisite: Preparatory Year  
Level: First  
Credit hours: 4(3+1)

Course Outline:
This course will introduce, at an entry level, the understanding of various cell structures and functions, eukaryotes vs. prokaryotes, classification of live organisms, introduction to the genetics and introduction to human biology including, introduction to human physiology, anatomy, and introduction to human embryology.

By the end of this course, student should be able to know:
- The cell as a functional unit, structure, and the main aspects of cell specialization, cytology and classification of live organisms.
- The transport mechanisms across the cell membrane
- The main principles of Physiology
- The cellular division and multiplication
- DNA and RNA, formation.
- DNA and the genetic code.
- Cellular processes needed for live
- Biochemical basis of generating energy
- Spermatogenesis – Oogenesis in human
- Fertilization and basic embryology
- Introduction to specialized anatomical structures
- Hormonal regulation of vital functions
- Neuronal regulation of vital functions

Teaching Organization:
- Theory lectures
- Laboratory sessions

Evaluation of students:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reference book designated:
Course Symbol: CHEM-104
Course Title: General Chemistry
Prerequisite: Preparatory Year
Level: First
Credit hours: 3(2+1)

Course Outline:
General concepts, chemical calculations, molecular weight and chemical reactions in aqueous solutions, energy and its transformation, chemical bonds and chemical reactions and the cyclic table, thermal chemistry, properties of substances and attraction forces between molecules, physical properties of solutions, chemical equilibrium and neutralization of acids and alkalines in aqueous solutions, chemical mobility.

By the end of this course, student should be able to:
- Describe the atomic structure and define atomic number, mass number and isotopes
- Know chemical and physical bonding and their properties
- Know types of chemical reactions and concept of rate of reaction
- Know mole, molar mass, molarity and molality and their use in laboratory
- Know calculation formulae and their use in clinical laboratory
- Know oxidation-reduction reactions and their biological significance
- Know different types of solutions and solubility
- Define acids, bases and describe acid-base reactions
- Understand concept of pH and its calculations
- Know buffers and their types
- Know activation energy and endothermic and exothermic reactions
- Know 1st and 2nd law of thermodynamics and chemical equilibrium

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation of students:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reference book designated:
- http://www.chemistry.ohio-state.edu
Course Overview:
This course gives the students brief informations about each department of applied medical sciences which involve the following:

Introduction to biomedical technology and medical equipments: In this part the student will acquire the technical and scientific ability to operate and maintain the relevant instruments and to work with the med-team to attain the proper planning and usage of these instruments.

Introduction to optometry: the student learns to distinguish the various optometric conditions of patients, early recognition of disease conditions and their development, as well as relevant prescriptions.

Introduction to medical laboratory: focuses upon training the student to be perform the analyses of biological samples and provide him with all the necessary information pertaining to achieve this objective.

Introduction to community health sciences: training the student to be highly qualified personnel equipped with the ability to educate the community to learn and apply healthy daily life styles.

Introduction to clinical nutrition; the student learn the various aspects of nutrition and the ways to maintain a healthy community by providing it with the means to adopt the proper nutritional life styles or needed nutritional treatments. In addition it enables him to deal effectively with nutritional problems arising in hospitals and other sections of the society.

Introduction to radiology: enable the student to acquire general and basic scientific knowledge and necessary techniques in the field of radiological science, and to acquaint him with the techniques of nuclear medicine and ultrasound and their applicability in diagnosis of various diseases.

Introduction to physical rehabilitation: gives the student the ability to utilize the various technologies used in physical therapy of incapacitated patient and all conditions requiring physical therapy intervention.

By the end of this course, student should be able to know:
- The various specialties in applied medical sciences
- The importance of each specialty and its role in the areas of health care
- The nature of each specialty which would enable him to chose the specialization most fitting to his abilities and inclinations.

Teaching Methods:
- Lectures
- Discussion

Evaluation Means:
- Semester Examination: 40%
- Final Examination: 60%

Reading List:
Internet source relevant material specific to each specialization as determined by the instructors.
Course symbol: AMS-111  
Course Title: Medical Terminology  
Prerequisite: Preparatory Year  
Level: First  
Credit hours: 2(2+0)

Course Outline:
This course covers the linguistic structural basis for scientific and medical terminology in Latin and English and explanation of the main terms in different applications of medical science specialties to enable advanced students in different branches and graduates deal easily with physicians and other workers in different specialties. The course also aims at acquainting students with the pronunciation, writing and understanding of general principal medical terms and abbreviations corresponding to their Arabic homologues.

By the end of this course, student should be able to:
- Correctly pronounce medical terms
- Explain the meanings of the common medical terms regularly usable in medical and health area
- Correctly understand sentences that include these terms and abbreviations
- Fluent conversation in English with workers in the health field

Teaching Methods:
- Lectures
- Discussion

Evaluation Means:
- Semester Examination: 40%
- Final Examination: 60%

Reading List:
- Comprehensive Medical Terminology. Betty Davis Jones
Course symbol: AMS-112  
Course Title: Health Care System and Vocational Safety  
Prerequisite: Preparatory Year  
Level: First  
Credit hours: 3(2+1)

**Course Outline:**
Introduction to applied health sciences, concept of health and factors affecting it, the general hierarchy of health services and their current and future needs, ethics of practice of the different health professions.

**By the end of this course, student should be able to:**
- Define health management
- Describe the organization of health management and its general hierarchy
- Define the health team and describe the principles of organization and control of the team.
- Explain the meaning of supervision and leadership
- Mention the principles of organization ethics
- Describe the levels of health care
- Define quality and describe how to achieve in health care services
- Mention the instruments and advantages of achieving quality of health care
- Know danger associated with health departments and affecting worker.
- Know safety procedures and problem solving in biohazard.

**Teaching Methods:**
- Lectures
- Discussion

**Evaluation Means:**
- Semester Examination: Written and practical 50%
- Final Examination: 50%

**Reading List:**
- Principles of Biomedical Ethics. Beauchamp and Childress.
- www.islamset.com (Islamic constitution of medical profession).
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<td>Prerequisite: BIOL-107</td>
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**Course outline:**
Introduction to anatomy of different regions and organs of human body
Systemic anatomy of: joints, lymph, digestive, urinary, reproductive, cardiovascular, respiratory, nervous (CNS and autonomic), musculoskeletal, endocrine, and embryology. Clinical anatomy of certain diseases in relation to systems organs

**By the end of this course, student should be able to:**
- Know the anatomical structure of the various systems of the human body.
- Know the relationship between some diseases and the anatomical structure.
- Know some facts about the human embryology.

**Teaching Methods:**
- Lectures
- Practical sessions.

**Evaluation Means:**
- Semester Examination: Written and practical 50%
- Final Examination: 50%

**Reading list:**
Course symbol: AMS-122  
Level: Second
Course Title: Principles of Physiology  
Credit hours: 3(2+1)
Prerequisite: BIOL-107

Course Outline:
This course is aimed to understand the basis of various physiological functions of the body from the cell as the smallest functional component of the body to the function of various organs, systems. Further, these systems will be studied with objective to enhance the concept of integrative physiology, as functions of these systems, to the most part, they are interrelated.

By the end of this course, student should be able to know:
- The basic aspects of physiology and body functions
- The function of cell organelles, and cell specialization
- The functional division of the Nervous System (NS)
- The function of NS and the exerted control on key body organs
- The human endoskeleton, movement and locomotion.
- The chemical messengers and Endocrine system
- The cardiovascular system and Hepatic circulation.
- The neural control of blood volume and pressure
- The body fluid compartments and the blood as a tissue and clotting.
- The renal system and Homeostasis
- The respiratory system and gas exchanges
- The respiratory-renal adjustment of acid base
- The digestive system
- The Pancreatic-Hepatic functions
- The reproductive system
- The ovarian, Hormonal and menstrual cycles

Teaching Organization:
- Theory lectures
- Laboratory sessions

Evaluation of students:
- Semester Examination: Written and practical  50%
- Final Examination:  50%

Reference book designated:
Human Physiology: From Cells to Systems by Lauralee Sherwood (2009)
Course Outline:
The course covers general subjects in organic chemistry including aliphatic and aromatic hydrocarbons, their properties and reactions, alkyl, halides, alcohols, ethers, phenols, aldehydes, ketones, amines and carboxylic acids.

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

- Know hydrocarbons, their classification, nomenclature, physical and chemical properties and describe aliphatic and aromatic hydrocarbons.
- Know reactions of deletion, addition and substitution
- Know methane, ethylene, and acetylene and mention their properties
- Know alkyl halides, ether and alcohol and their classification and their physical and chemical properties
- Know aldehydes and ketones and their physical and chemical properties
- Define aromatic compounds, describe benzene structure and mention their physical and chemical properties
- Know carboxylic acids, their classification and their chemical and physical Properties

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
Course symbol: CHEM-120  
Level: Second  
Course Title: Analytical Chemistry  
Credit hours: 3(2+1)  
Prerequisite: CHEM 104

Course Outline:
The course includes a survey of the classical methods of chemical analysis, the underlying theoretical concepts, and a brief introduction to modern instrumental analysis techniques.

By the end of this course, student should be able to:
- Describe the applied chemical principles used for separation, detection, identification, and quantification of samples constituents.
- Know statistical principles for chemical analysis.
- Describe qualitative and quantitative analysis, i.e., gravimetric and volumetric analysis, concepts of acid-base, redox reactions, precipitation reactions, titrimetric analysis, spectrophotometric and chromatographic analysis as well as electrochemical behavior.
- Principles of quality control.

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
- Analytical Chemistry - An Introduction Douglas A. Skoog 7th Edition, 2000-
Course Outline:
This course covers the general principles of microbiology including classification of different groups of microbes, morphology of each group and study of their characters. Also the study includes a brief introduction to the infectious diseases regarding their types, causative microbial agents and methods of their control together with study of food and air microbiology.

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

General Bacteriology:
Introduction to bacteriology, morphological shape of microorganisms, structure of bacterial cell, reproduction and growth of bacteria, physiology of microorganisms, physical conditions required, or growth of bacteria, bacterial genetics, bacterial relationship, bacteriophage, bacterial metabolic products, system of bacterial identification, Infection, pathogenicity and virulence, chemotherapy and food bacteriology.

General Virology:
Introduction to virology, classification of viruses, structure of viruses, growth of viruses, viral genetics, Infection and pathogenicity of virus diseases.

General Mycology:
Introduction to mycology, classification of mycology, structure of fungi, reproduction of fungi, growth of fungi, Infections, pathogenicity and food mycology.

General Parasitology:
Introduction to parasitology, general definitions, Infections and pathogenicity of parasites. Epidemiology of parasites, diagnostics of parasites, control of parasites, classification of parasites: (Protozoa, Helminthes, and Arthropods).

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading Lists:
**Course Outline:**
The aim of this course is to identify light microscopic structure of various normal human body organs and tissues in addition to the study of cell structure, and cell division.

**By the end of this course, student should be able to know:**
- Cell structure and division, chromosomes and genes.
- Epithelial tissue.
- Connective tissue, blood and lymphoid tissue.
- Muscular tissue
- Nervous tissue.
- Histology of digestive system.
- Histology of urinary and genital system.
- Histology of respiratory system.
- Histology of cardiovascular system.
- Histology of endocrine glands

**Teaching methods:**
- Lectures.
- Practical sessions.

**Means of evaluation:**
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

**Reading list:**
Course symbol: MDL-212  Level: Third
Course Title: General pathology  Credit hours: 3(2+1)
Prerequisite: AMS-122

Course Outline:
This course contains introduction to general and basic knowledge of diseases, their causes, pathogenesis, general morphological and changes at gross, microscopic and submicroscopic levels as well as the prognosis of the disease.

By the end of this course, student should be able to know:
- Definition of pathology and disease, causes of diseases, pathology specimens and methods of pathological studies and their relation to clinical aspects.
- Inflammation and repair.
- Cell injury, degeneration, tissue deposits, necrosis, gangrene.
- Circulatory disturbances.
- Infection and granuloma.
- Growth disorders and tumors.

Teaching methods:
- Lectures.
- Practical sessions.

Means of evaluation:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading list:
- Surgical Pathology, 9th edition, 2004. Rosai and Ackerman
Course symbol: AMS-210  
Level: Third  
Course Title: Ambulance Care  
Credit hours: 2(1+1)  
Prerequisite: AMS-121

Course outline:
This course includes teaching the methods of dealing with critical clinical cases. The student should know how to diagnose these cases, give the first aid procedure and call the ambulance in the proper time.

By the end of this course, student should be able to:
- Know the critical clinical cases.
- Diagnose these cases.
- Give the first aid of these cases.
- Call the ambulance in the proper time.

Teaching Methods:
- Lectures
- Practical sessions

Evaluation Means:
- Semester Examination: Written and practical 50%
- Final Examination: 50%

Reading list:
- Internet source material specific to each critical clinical case as determined by the instructors.
- Workshops given by ministry of health and Red Cresset
Course symbol: MDL-213  
Level: Third  
Course Title: Medical Microbiology  
Credit hours: 3(2+1)  
Prerequisite: MDL-120

Course Outline:
This course covers studying of different types of human diseases that caused by different types of microbes, like viruses, bacteria, fungi, and parasites. Also, student should be able to know the different methods of identification of these microbes, using both traditional and recent techniques, prevention and treatment.

By the end of this course, student should be able to:
Identify the different human diseases that caused by different microbes and how to identify them, prevent them and treat them:
**Medical Bacteriology:** Identify the different types of bacteria that cause human diseases and their classifications like corynbacterium diphtheriae, (diphtheria), mycobacterium tuberculosis (TB), mycobacterium leprae (leprosy), salmonella typhi (typhoid fever), proteus a common saprophyte of decaying organic matter and yersinia pestis (plague). In addition, student should know the procedure of diagnoses by direct microscopy, culture, ELISA and PCR.

**Medical Virology:** Identify the various groups of human viruses that comprise herpes, oncogenic, hepatitis, influenza, HIV and polio virus. Also, identify the clinical manifestations and describe these human diseases and role of transmission and mechanism of viral pathogenicity. In addition, student should be able to know different techniques in viral detection, as immunofluoresence technique, ELISA, indirect hemagglutination test, complement fixation test, PCR, and how to isolate viruses by using chicken embryo, tissue culture, or experimental animals.

**Medical Mycology:** Identify the various groups of medical mycoses that comprise superficial, cutaneous, subcutaneous and systemic mycosis. Also, identify the different manifestations by laboratory technique that include direct microscopy, culture, serology, and PCR with emphasis on mycosis.

**Medical Parasitology:** Identify the various groups of medical parasitosis and describe their clinical manifestations by means of laboratory diagnosis such as direct (microscopy) and indirect (serology) methods.

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Exam.: Written and Practical 50%
- Final Exam.: 50%

Reading List:
- Practical Medical Microbiology. Mackie and McCortney, 1996.
Course symbol: MDL -214
Course Title: Principles of Biochemistry
Prerequisite: CHEM-109
Level: Third
Credit hours: 3(2+1)

Course Outline:
This course offers detailed study of the chemical compositions and the biological functions of the main biochemical molecules including carbohydrates, proteins, lipids and their components, enzymes and different types of hormones. It also includes methods of practical qualitative and quantitative assays to discover these molecules.

By the end of this course, student should be able to:
- Know and classify the different groups of carbohydrates and their main biological significance with brief reference to some pathological conditions such as diabetes.
- Know and classify the main lipids and describe their chemical structures and biological significance with brief reference to some pathological conditions caused by lipid disorders such as artherosclerosis.
- Know amino acids, their classification, physical and chemical properties as well as describing their chemical structures, their main biological significance.
- Know proteins, their structures and physical and chemical forces affecting their structure with brief reference to some common proteins, e.g., haemoglobin, hormones e.g. insulin and immunoglobulin e.g. IgG
- Describe enzymes and their role in the biological reactions and as well as their diagnostic role in many diseases e.g. enzyme amylase in pancreatitis.
- Know the structure of nucleic acids i.e. DNA and RNA and their role in protein biosynthesis with brief reference to some of genetic disorders such thalassaemia and cystic fibrosis.

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:


Course Outline:
This course presents detailed description to the structure of the immune system and its tissues, cellular properties, functions and chemical elements especially cytokines. It is also includes definition of innate and acquired immunity, different mechanisms of immune response and hypersensitivity and its types. The course also gives detailed explanation of immunity against microbial injuries and methods of prophylaxis, serological and immunological diagnosis of microbial infection, immunodeficiency diseases, vaccine and toxoid action and preparation for prevention and treatment. In addition a brief introduction will be given on tissue typing on organ transplantation with great emphasis on laboratory equipment related to immunological diagnosis as ELISA, immunoblotting techniques, and PCR.

By the end of this course, student should be able to know:
- Innate (non-specific) immunity
- Complement system, antigens.
- Structure and function of immunoglobulin
- Classes of immunoglobulin: isotypes and allotypes
- Genetics of idiootypes, antigen-antibody reactions and test for these reactions
- Antibody formation, cells involved in immune responses, major histocompatibility complex, response to antigen.
- Cell-mediated immunity, immunoregulation, immunization, tolerance and autoimmunity.
- Hypersensitivity states, tumor immunology.
- Immunodeficiency (congenital and acquired).

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
Course Outline:
This course includes identification of pathology specimens, registration, gross examination and selection of diseased parts. Also studying methods of tissue processing as embedding, cutting and staining procedures either routinely, histochemically or immunohistochemically.

By the end of this course, student should be able to:
- receive and registration of specimens.
- Gross examination.
- Know fixation: - general usage - types of fixatives - factors affecting fixation.
- Perform tissue processing: tissue embedding, sectioning, microtomes, frozen sections
- Perform staining: - routine Hx&E staining – know the artifacts in histologic sections
- Perform histochemical and immunohistochemical staining

Teaching methods:
- Lectures.
- Practical sessions.

Means of evaluation:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading list:
Course symbol: MDL-223  
Course Title: Pathophysiology  
Credit hours: 3(2+1)  
Prerequisite: MDL-212

Course Outline:
The aim of this course is to give a summarized idea about structural and physiological aspects of different diseases affecting body organs and tissues with correlation to pathological process in laboratory and clinical findings and also the basic lines of management. The study is practically aided by identifying tissue sections of normal tissues compared different common diseases.

By the end of this course, student should be able to:
- Understand, and apply basic facts and concerns about normal function of different systems and correlate between functional disorders and disease process.
- Correlate pathological changes and functional disorders to abnormal laboratory findings.
- Know histological structure and function as well as functional disorders and common diseases affecting different body organs and tissues.

Teaching methods:
- Lectures.
- Practical sessions.

Means of evaluation:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading list:
- Pathophysiology review, classical clinical cases, 2002.
Course Outline:
This course presents introductory biochemistry relevant to human health and disease that forms part of the foundation of modern medical practice. The molecular correlation with disease is emphasized throughout the course.

By the end of the course, student should be able to:
- Develop a broad and thorough understanding at the molecular level of metabolic and regulatory events that control the function of normal cells, tissues and organs and understand how these processes are altered by disease.
- Describe the steps by which cells break down biological molecules to extract energy for the performance of work.
- Describe major cellular biosynthetic pathways, steps involved in these pathways and the regulation of key enzymes.
- Explain the lipid transport disorders and their relation to health.
- Explain energy balance and its disorders.
- Major metabolic disorders related to artherosclerosis, stroke, and diabetes.
- Understand genetic mutations and disease cases.

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
- Medical Biochemistry at a Glance, 2nd Edition
  blackwellpublishing.com/book.asp?ref=1405113227
Course symbol: MDL- 225  
Course Title: Biostatistics  
Prerequisite: AMS-112  
Level: Fourth  
Credit hours: 3(2+1)

Course Outline:
This course presents detailed description of characters types, displaying and presenting data, measures of central tendency, measures of dispersion, principles of probability, random variables and probability distribution, bimodal distribution, natural distribution, confidence intervals for mean, median, ratios and various statistics tests.

By the end of this course, student should be able to:
- Identify the different methods of collecting data.
- Interpret different types of data summaries including tables and charts.
- Show the advantages and disadvantages of different types of data presentation.
- Identify measures of central tendency and measures of dispersion and interpreting them.
- Estimate means and their confidence intervals and interpret results
- Identify properties of natural distribution and explain the diverse repeated distribution of biomedical data.
- Apply the suitable test for a list of specific data such as student T test, F test, or chi-square test.
- Use of computer applications in biomedical data analysis.

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
- Introductory Biostatistics for the Health Sciences. Chernick M and Friis R
Course symbol: MDL-311  
Level: Fifth  
Course Title: Hematology  
Credit hours: 3(2+1)  
Prerequisite: MDL–211

Course Outline:
This course includes identification of blood cells, their normal counts, morphology and study important blood diseases including coagulation and bleeding disorders

By the end of this course, student should be able to:
- Describe normal hematopoiesis and morphology of blood cells and platelets.
- Define and classify anemia types, bleeding and clotting.
- Define leucocytosis, leucopenia and enumerate their possible causes.
- Define and classify leukemia and describe features of blast cells in blood film and bone marrow.
- Make blood film to diagnose different types of anemia and leukemia

Teaching methods:
- Lectures.
- Practical sessions.

Means of evaluation:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading list:
Course symbol: MDL- 312  
Course Title: Histopathology  
Prerequisite: MDL- 212  
Level: Fifth  
Credit hours: 3(2+1)

Course Outline:
This course aims to give detailed informations about different diseases affecting body organs and tissues with correlation to pathological process and microscopic findings. The study is practically aided by tissue sections of different affected lesions of the body.

By the end of this course, student should be able to:
- Define biopsy in clinical and laboratory practice, tissue processing and staining.
- Understand the pathologic changes at gross and microscopic levels of various common diseases affecting different systems and tissues and correlate between functional disorders and disease process.
- Describe microscopic picture of different common lesions that affecting body organs and tissues.
- Know the immunological staining and molecular tests in diagnostic laboratory.

Teaching methods:
- Lectures.
- Practical sessions

Means of evaluation:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading list:
- Pathologic basis of disease, 7th ed. By Robbins and Cotran
- Surgical pathology, 9th ed. by Rosai and Ackerman.
- Curan atlas of pathology
Course outline:
This course discusses the role of biochemistry in clinical diagnosis, perform biochemical analyses using a variety of instruments; assess quality control data to permit result release; explain the pathogenesis of major organ diseases and assist in the interpretation of results in routine clinical biochemical testing.

By the end of this course, student should be able to:
- Understand the principles of clinical biochemistry related to health and disease.
- Perform routine clinical testing and describe the levels of various analyses, i.e., blood glucose, blood lipids, blood electrolytes, liver function tests, kidney function tests, hemoglobin measurement, separate blood proteins and hemoglobin types by electrophoresis.
- Perform special laboratory tests such as cardiac enzymes.
- Identify plasma and urine drug concentration in toxicological cases and their measurements.
- Investigate common laboratory equipments used in urine and blood samples.
- Quality control procedure governing biochemical equipments.

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
<table>
<thead>
<tr>
<th>Course symbol: MDL- 314</th>
<th>Level: Fifth</th>
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<tbody>
<tr>
<td>Course Title: Electron Microscopy</td>
<td>Credit hours: 3(1+2)</td>
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<td>Prerequisite: MDL- 222</td>
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**Course outline:**
This course aims to study techniques of histological preparations of samples and tissue sections to be examined by transmission and scanning electron microscopes. These techniques including different processes and materials used in fixation, washing, dehydration, embedding and sectioning by ultra-microtome then staining of ultra-thin sections and afterwards examining by electron microscope.

**By the end of this course, student should be able to:**
- Know the various techniques of samples and tissue sections preparations.
- Know the various materials and instruments used in preparation of different samples to be examined by electron microscopes.
- Know the different types of electron microscopes.
- Read the results from certain slides and solve trouble shooting.

**Teaching Methods:**
- Lectures
- Practical Sessions

**Evaluation Means:**
- Semester Examination: 50%
- Final Examination 50%

**Reading list:**
Level: Fifth  
Course symbol: MDL- 315  
Course Title: Clinical Parasitology  
Credit hours: 3(2+1)  
Prerequisite: MDL- 213

Course Outline:
This course offers the basics of medical parasitology where it includes classification of endo- and exoparasite including study of life cycles and ways of pathogenecity together with brief clinical description and determining suitable clinical specimens for laboratory diagnosis using the light microscopy and other laboratory tests such as immunoserological methods e.g. ELISA and PCR.

By the end of this course, student should be able to:
Know general definitions of parasitism, parasitosis of the digestive system, blood and lymph systems, respiratory system, excretory and reproduction system, nervous system, eye, skin, nose, ear and neck, muscles and connective tissues.

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
Course symbol: MDL-316  
Course Title: Clinical Bacteriology  
Level: Fifth  
Credit hours: 3(2+1)  
Prerequisite: MDL-213

Course Outline:  
This course covers studying of different types of bacteria that cause diseases in human and their phenotypic characteristics and their structures in relation to bacterial pathogenicity, as well as, the diagnosis, prevention and treatment of these bacteria.

By the end of this course, student should be able to:  
Identify different types of bacteria that cause human diseases and their classifications like corynbacterium diphtheriae (diphtheria), mycobacterium tuberculosis (TB), mycobacterium leprae (leprosy), salmonella typhi (typhoid fever), proteus a common saprophyte of decaying organic matter and yersinia pestis (bubonic plague). In addition, student should be able to know the virulence determinants of bacteria and the mechanism of bacterial pathogenesis and diagnosis (direct microscopy, culture, PCR) and treatment of pathogenic bacteria by conducting sensitivity test.

Teaching Methods:  
- Lectures  
- Seminars  
- Practical sessions

Evaluation Means:  
- Semester Examination: Written and Practical 50%  
- Final Examination: 50%

Reading List:  
- Medical Microbiology. Greenwood et al. 2002  
- Practical Medical Microbiology. Mackie and McCortney, 1996.
Course symbol: MDL-321  
Course Title: Pharmacology and Antimicrobial  
Prerequisite: MDL-213/214

Level: Sixth  
Credit hours: 3(2+1)

**Course Outline:**
This course deals with history and principles of pharmacology, principles of absorption, distribution, and elimination of drugs, mechanisms of actions, dynamics, negative side effects, drug interactions and drug classes with emphasis on chemotherapeutics. It also discusses activity of antibiotics in relation to their structure, culture and sensitivity, antibiotics and producer organisms, and the individual antibiotics. In addition: a brief information will be given on antiviral, antifungal and anthelmintics (antiparasites).

**By the end of this course, student should be able to know:**
- General pharmacology:
- Pharmacokinetics (absorption, distribution, metabolism and excretion)
- Pharmacodynamics (mechanism of drug action)
- Chemotherapy of microbes
- Classification of antibacterial agents and resistance
- Adverse reactions of antibacterial agents and interaction.
- Prophylaxis of infection with antibiotics and abuse
- Activity of antibiotics in relation to their structure including quantitative determination, minimum bacteriostatic concentration (MIC) and Minimum bactericidal concentration (MBC)
- Culture and sensitivity (antibiotic approach) and producer organisms
- Individual antibiotics (in brief) beta-lactam antibiotics, bminoglycosides, sulphonamides, tetracyclines, chloramphenicol, macrolides, miscellaneous and chemotherapy of tuberculosis.
- Antifungal, antiviral and anthelmintics (antiparasites).

**Teaching Methods:**
- Lectures
- Seminars
- Practical sessions

**Evaluation Means:**
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

**Reading Lists:**
- The Antimicrobial Drugs by Eric M. Scholar and William B. Pratt, 2000
Course symbol: MDL- 322  
Course Title: Medical Genetics  
Level: Sixth  
Prerequisite: MDL- 213/214  
Credit hours: 3(2+1)

Course Outline:
This course aims at give a summarized idea about principles of medical genetics and its applications in health and disease through studying chromosomal map, genetic control of cell functions, mutations, and diseases resulting from chromosomal aberrations, Mendelian disorders and multifactorial disorders. Also it deals with modern techniques and laboratory tests to diagnosis genetic diseases, genetic engineering and genetic counseling.

By the end of this course, student should be able to:
- Define chromosome, chromosomal map, genes and chromosomal aberrations and mutation.
- Explain genetic control of cell function and protein synthesis.
- Classify genetic disorders into cytogenetic, Mendelian and multifactorial disorders.
- Recognize the basis of laboratory tests used in screening and diagnosis of genetic disorders and premarital evaluation (screening).
- Genetic engineering and gene therapy

Teaching methods:
- Lectures.
- Discussion and case studies.

Means of evaluation:
- Semester examination: 50%.
- Final examination: 50%.

Reading list:
- Medical Genetics, Ekram Abdel-Salam, Cairo, 2006.
- Medical Genetics at a glance, by Dorian Pritchard, Bruce R Korf, Blackwell Publishing.
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<tr>
<th>Course symbol: MDL- 323</th>
<th>Level: Sixth</th>
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<tbody>
<tr>
<td>Course Title: Body Fluid Analysis</td>
<td>Credit hours: 3(2+1)</td>
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<tr>
<td>Prerequisite: MDL- 313</td>
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**Course Outline:**
This course discusses water and electrolytes balance, physiological regulation of water and electrolytes balance, urinalysis and urine sediments, seminal fluid, cerebrospinal fluid, senovial fluid, exudates, transudates, Mucus and pus.

**By the end of this course, student should be able to analyze:**
- Urinalyses and Urine Sediment.
- Water and electrolytes.
- Cerebrospinal fluids (CSF).
- Seminal Fluid
- Senovial Fluid
- Exudates and Transudates.
- Kidney and gall bladder stones.
- Trace minerals concentrations in blood.
- Acid-base balance and its disorders.
- Mucus and pus

**Teaching Methods:**
- Lectures
- Discussion
- Practical sessions

**Evaluation Means:**
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

**Reading List:**
- Urinalysis and Body Fluids :Susan King King Strasinger, Marjorie Schaub Di Lorenzo. 2001
Course symbol: MDL- 324  
Course Title: Blood Banking  
Prerequisite: MDL- 221/311  
Level: Sixth  
Credit hours: 3(2+1)

Course Outline:
During this course the student will study blood phlebotomy, transportation and preservation with emphasis on antigens and antibodies reactions. Also it is include performance of blood banking procedures including blood grouping and Rh typing, antibody screens, antibody identification, cross matching, elution, and extract blood products such as platelet and plasma.

By the end of this course, student should be able to:
- Examine blood donors and select the proper one by certain tests.
- Perform cross matching.
- Identify the common and rare blood groups.
- Understand the mechanisms of incompatibility reactions in the human body.
- Extract blood products e.g. platelets, cryoplasma
- Educate community in blood donation campaign

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
- Textbook of Blood Banking and Transfusion Medicine
  Sally Rudmann, PhD, MT(ASCP)SBB, CLS, Professor and Director 2005.
Course symbol: MDL-325  
Level: Sixth  
Course Title: Clinical Virology  
Credit hours: 3(2+1)  
Prerequisite: MDL-213

Course Outline:
This course covers studying of different types of human viruses, their structures in relation to viral pathogenicity, symptoms and diagnosis. In addition to incidence and management of these viral infections.

By the end of this course, student should be able to:
- Identify various groups of human viral diseases such as herpes and others.
- Identify clinical manifestations and describe viral diseases in term of transmission and mechanism of viral pathogenicity and symptoms.
- Know to diagnose viral infection by different techniques in viral detection such as immunofluorescence technique, ELISA, indirect hemagglutination test, complement fixation test and PCR.
- Isolate the viruses by using chicken embryo, tissue culture, or experimental animals.
- Know the managements of viral infections.

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading Lists:
- Medical Virology(4th ed.), Fenner and White, 1996
- Principles and Practice of Clinical Virology, 5th ed. Zukerman et al
Course symbol: MDL -326  
Course Title: Clinical Mycology  
Prerequisite: MDL -213  
Level: Sixth  
Credit hours: 3(2+1)

Course Outline:
This course includes; study of different fungi types that cause diseases in human, their structures, characters, in addition to, incidence, diagnosis and management of mycoses.

By the end of this course, student should be able to:
- Identify various groups of medical mycoses.
- Identify superficial, cutaneous, subcutaneous and systemic mycosis.
- Differentiate fungal infection from other disease by symptoms and clinical manifestation.
- Perform laboratory diagnosis of these fungi that including classical materials (direct microscopy, culture, serology) and modern techniques.
- Know management of medical mycosis.

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading Lists:
Course symbol: MDL-411  
Course Title: Laboratory Management  
Prerequisite: AMS-112/MDL-225  
Level: Seventh  
Credit hours: 2(2+0)

Course Outline:
This course gives an introduction to laboratories and their types, management, departments, laboratory information system (LIS), sample collection, transportation and preservation, quality assurance. It also includes dealing with instruments and its trouble shooting, methods of analysis, safety precaution, and recognition of laboratory dangers.

By the end of this course, student should be able to:
- Define laboratory management
- Describe general plan of administrative organization of diagnostic and reference laboratories
- Describe components of laboratory information system (LIS).
- Describe the methods of specimen collection, transportation, preservation and storage
- Write result reports properly
- Understand the importance and relevance of quality assurance.
- Describe the important procedures for selecting equipments, their operation and maintenance according to certain guidelines.
- Perform quality control test to the equipments and diagnostic consumables
- Describe safety procedures in different diagnostic and research laboratories

Teaching Methods:
- Lectures
- Discussion

Evaluation Means:
- Semester Examination: 40%
- Final Examination: 60%

Reading List:
Course symbol: MDL- 412  
Course Title: Epidemiology  
Prerequisite: MDL- 221/225  
Level: Seventh  
Credit hours:  3(2+1)

Course Outline:
This course deals with epidemiology and sources of infections in the community in particular especially that related to medical facilities (nosocomiel). Also it includes measures of prophylaxis, disinfection and sterilization in addition to contagious disease

By the end of this course, student should be able to know:
- Biology of Infectious Diseases 
- Epidemiology of bacterial, rickettsia, chlamydia, virus, fungi and parasitic diseases 
- Plan to control contagious diseases by prevention, vaccination and education. 
- Zonotic diseases 
- nosocomiel infections

Teaching Methods:
- Lectures 
- Seminars 
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50% 
- Final Examination: 50%

Reading List:
Course symbol: MDL- 413
Course Title: Cellular and Molecular pathology
Prerequisite: MDL- 223/ 322
Level: Seventh
Credit hours: 3(2+1)

Course Outline:
Thos course is intended to study molecular basis of diseases and tumors in relation to their morphological and laboratory expression. It also includes identification of abnormal and malignant cells in pathological fluids and body discharges as well as fine needle aspiration specimens and its diagnostic applications. The study is aided by practical cytological smears of common lesions.

By the end of this course, student should be able to:
- Describe cell cycle and cell division.
- Understand molecular basis of various pathologic changes such as, cell injury, inflammation, necrosis, edema, carcinogenesis, genetic disorders and mutation.
- Perform image analysis, immunohistochemistry, flow cytometry and insitu hybridization to diagnose immunological graft rejection in organ transplantation.
- Describe microscopic features of malignancy in cytological smears of common lesions such as normal and malignant epithelial cells in urine, dysplastic and malignant cells in pleural aspirate and peritoneal fluid, inflammatory and dysplastic cells in cervicovaginal smears.
- Understand fine needle aspiration (FNA) of breast fibroadenoma and infiltrating duct carcinoma.
- Analyze genital cellular fluids male and female.

Teaching methods:
- Lectures.
- Practical sessions.

Means of evaluation:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading list:
- Diagnostic Molecular Pathology, By: Mark H Stoler MD. 2007
Course Outline:
In this course students are introduced to applied aspects of immunological processes clinically and serologically. Explanation of immunological basis of the clinical condition is presented and the common laboratory serological tests related to immunological phenomena are also studied to evaluate patient's immune system and vaccine titration.

By the end of this course, student should be able to:
- Discuss basic clinical immunology methods.
- Discuss the theory and principles of routine clinical immunology procedures.
- Perform and interpret routine procedures used in serological laboratory.
- Report clinical immunology results and vaccine evaluation.
- Demonstrate proficiency in the performance of routine serological tests for syphilis including RPR, VDRL (for screening) and other techniques such as TPHA, Widal, Latex, EIA, and immunoblotting techniques.
- Perform fluorescent procedures according to established laboratory guidelines.
- Utilize appropriate samples, controls and serological kits and correctly perform the following tests according to the manufacturer's instructions

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
Course Outline:
The aim of this course is to train students on the principles and practices of instrumental analysis, involving the use of modern automated instrumentation in biochemical and medical applications. It also explain general laboratory instrumentation and support units, spectrophotometric and fluorescent techniques, clinical analyzers, immunoassays, automated hematology techniques, atomic absorption, advanced automated separation techniques of chromatography (HPLC, GC, GC-MS, LC-MS), flow cytometry and modern electrophoreses techniques and their applications in clinical, nutritional, environmental, drugs and narcotic abuse.

By the end of this course, student should be able to:
- Establish self confidence in dealing with instrumentation.
- Describe theoretical concept behind the design of instruments.
- Describe major operational requirements for each category of instrumentation.
- Describe application and utilization for each instrument in applied medical sciences.
- Handle trouble shooting procedures and regular maintenance with quality control measure.
- Demonstrate procedure of operation of major advanced instruments to others.
- provide complete description of necessary equipments in medical laboratory.
- work in research centre and reference laboratory

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
- Clinical Biochemistry: Techniques and Instrumentation: John S Varcoe 2001
- http://www.anachem.umu.se/jumpstation.htm
- http://www.uvm.edu/~jgoldber/courses/chem221/links.html
Course symbol: MDL- 416  
Course Title: Research Seminar I  
Prerequisite: MDL- 225  
Level: Seventh  
Credit hours: 1(0+1)

Course Outline:
Training on project establishment and methodology of execution including literature reviewed and use scientific information resources.

By the end of this course, student should be able to:
- Learn the essential steps the usage of library and electronic search
- Know types of scientific papers, thesis and journals
- Learn the classification of collected information in priority order
- Design a complete and basic research proposal.

Teaching Methods:
The student carries out a thorough literature search using different scientific resources under the supervision of a faculty staff member

Evaluation Means:
Written report 50%
Presentation and verbal examination 50%

Reading List:
- As directed by the student's advisor.
**Course symbol:** MDL-421  
**Level:** Eighth  
**Course Title:** Diagnostic Molecular Biology  
**Credit hours:** 3(2+1)  
**Prerequisite:** MDL-413

**Course Outline:**
This course describes principles of modern techniques used in bio-molecular diagnosis with emphasis on biomedical molecular biology, gene mapping (genome), nucleic acid alteration (mutation) and genetic finger printing.

**By the end of this course, student should be able to:**
- Know basic biochemical and molecular biology.
- Perform major molecular diagnostic techniques such as nucleic acid extractions and purifications, blotting techniques, electrophoresis for molecular detection and mutation analysis, PCR for molecular detection techniques, fluorescence *in Situ* hybridization, DNA sequencing technique for forensic science, DNA variation (polymorphisms), gene expression analysis and medical cytogenetics.
- Apply of molecular diagnostic techniques in genetic diseases, human cancer, infectious diseases, cardiovascular diseases, identity based testing, genetic finger printing, genome and genetic engineering.
- Perform quality assurance in the molecular diagnostic laboratory.

**Teaching Methods:**
- Lectures
- Discussion
- Practical sessions

**Evaluation Means:**
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

**Reading List:**
Course symbol: MDL- 422  
Level: Eighth  
Course Title: Applied Immunology and Hematology  
Credit hours: 3(1+2)  
Prerequisite: MDL - 414

Course Outline:
This course deals with clinical and laboratory applications for important immunological and hematological disorders aided by case studies and explanation of laboratory findings.

By the end of this course, student should be able to:
- Know Immune mechanisms and diseases classification.
- Understand immunological basis of organ transplantation and HLA typing.
- Enumerate laboratory findings in different immunological disorders.
- Classify anemia and describe microscopic picture and laboratory findings of hemostasis disorder
- Define leukocytosis, leukopenia in relation to the underlying disease such as leuckemia and lymphoma.

Teaching methods:
- Lectures.
- Practical sessions

Means of evaluation:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading list:
- Immunohematology Principles and Practice. 2nd ed. By Eva D Quinley MS, MT(ASCP).
- Blood Principles and Practice of Hematology, 2nd ed By Robert I Handin MD; Samuel E. Lux MD; Thomas P Stossel MD.
- Pathologic Basis of Disease, 7th edition By Robbins and Cotran.
Course Outline:
This course covers studying of different microbes in term of isolation and identification of viruses, bacteria, yeasts, fungi and parasites that infect the different organs with interest in clinical practice of microbiology throw case studies.

By the end of this course, student should be able to:
Identify, diagnose and treat microbes infection of the gastrointestinal tracts, genito-urinary, central nervous systems, and diseases affecting eye, skin and musculoskeletal tissues

Teaching Methods:
- Lectures
- Seminars
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading Lists:
- Practical Medical Microbiology. Mackie and McCortney, 1996.
Course symbol: MDL- 424
Course Title: Applied Clinical Biochemistry
Prerequisite: MDL- 323
Level: Eighth
Credit hours: 3(1+2)

Course Outline:
The aim of this course is to train students on different routine and special clinical biochemistry tests used in clinical laboratories and all technical and scientific procedures related to these tests.

By the end of this course, student should be able to:
- Know clinical biochemistry tests and their application and operation of equipments
- Prepare standard operating procedure (SOP) manuals
- Prepare and perform quality control procedures for all tests
- Know method settings and evaluations
- Know result interpretation, reporting and authorization
- Advice and train the medical and laboratory staff
- Contribute to research and development in the laboratory

Teaching Methods:
- Lectures
- Discussion
- Practical sessions

Evaluation Means:
- Semester Examination: Written and Practical 50%
- Final Examination: 50%

Reading List:
- Clinical Biochemistry: Techniques and Instrumentation: John S Varcoe 2001
**Course symbol:** MDL- 425  
**Level:** Eighth  
**Course Title:** Case Study and Results Interpretation  
**Credit hours:** 2(2+0)  
**Prerequisite:** MDL- 411

**Course Outline:**
During this course students will study and prepare selected case studies for different disease conditions including physiological, pathological, clinical, and diagnostic aspects. Student will thoroughly study the case designated and carry out all investigation to draw final diagnosis. The work will be presented in the form of written report and seminar presentation.

**By the end of this course, student should be able to:**
- Study different disease conditions and perform required investigations and draw right diagnosis
- Prepare selected case study for disease condition using patient medical records and other scientific resources
- Interpret laboratory results and statistics of the case
- Prepare and write detailed report.
- Present case study in form of seminar and discuss it in depth with his colleagues and instructor

**Teaching Methods:**
Written report  
Seminar presentation  
Verbal and questions

**Evaluation Means:**
- Scientific Report  50%
- Presentation and Discussion  25%
- Verbal Exam  25%

**Reading List:**
- As directed by the student's advisor.
Level: Eighth
Course symbol: MDL -426
Course Title: Research Seminar II
Credit hours: 2(1+1)
Prerequisite: MDL -416

Course Outline:
This course helps student to start predetermined project including data acquisition and analysis then write report under the supervision of a faculty staff member.

By the end of this course, student should be able to:
- Conduct practical research
- Collect data
- Analyze data
- Trouble shooting
- Write research progress reports
- Write a final “paper” format with presentation in form of seminar.

Teaching Methods:
The student conduct the practical research project under the supervision of a faculty staff member

Evaluation Means:
- Written Report 50%
- Viva Examination 50%

Reading List:
- As directed by the student's advisor.