

Jordan University of Science and Technology

Faculty of Medicine

2018-2019

COURSE TITLE: Musculoskeletal and Integumentary System.

COURSE CODE: MED 292.

CREDIT HOURS: 5 CREDIT HOURS

SEQUENCE: YEAR 2, SECOND SEMESTER, 5 WEEKS

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COURSE DESCRIPTION

Definition

Interdisciplinary Integrated Module Covering the Musculoskeletal and Integumentary Systems.

Course Symbol

MED 292

Credit Hours

5 Credit Hours

Duration

5 Calendar Weeks

Participating Departments

- Basic Sciences:
 - Anatomy.
 - Pathology and Microbiology.
 - Pharmacology.
 - Physiology and Biochemistry.
- Clinical Sciences:
 - Diagnostic Radiology.
 - Internal Medicine (Dermatology Division).
 - Special Surgery (Orthopedics Division).

Goal

Providing medical students with comprehensive knowledge about bones, joints, muscles, tendons, ligaments, skin and associated soft tissues, all in relation to clinical manifestations of disease.

GENERAL OBJECTIVES

A Musculoskeletal System

1. Identify and describe bones, muscles and joints of the upper and lower limbs as well as the vertebral column, together with the innervations and actions of the muscles associated with them.
2. Describe the normal development of the limbs and vertebral column together with possible congenital abnormalities.
3. Understand the metabolism of muscles and bones as well as the biochemical and molecular basis of diseases affecting them.
4. Describe the mechanism of muscle contraction and understand the mechanism of muscle action.
5. Describe the pharmacokinetics, pharmacodynamics and adverse effects of drugs affecting the musculoskeletal system.
6. Understand the pathogenesis and pathological features of the diseases that affect bones, joints, muscles and other related soft tissues.
7. Study the pathogenic microbes affecting the musculoskeletal system and the infections they cause.
8. Understand the epidemiology and control of the common injuries that may affect the human musculoskeletal system.

B Integumentary System

9. Describe the macroscopic and microscopic features of the skin and subcutaneous tissues.
10. Study the biochemical processes of normal skin and subcutaneous tissues.
11. Study the pathogenic microbes affecting the skin and subcutaneous tissues and the infections they cause.
12. Recognize the pathogenesis and the pathological changes that occur in the skin and the features of selected major diseases of the skin.

C Basic Research

13. Introduce basic research skills in relation to this module.

TEACHING FORMATS

Lectures

One hour-long lectures will highlight and cover the objectives set in this syllabus. These are the main study materials for the students, but are NOT the main reference for knowledge. Therefore, they are NOT a substitute for the recommended textbooks and do NOT necessarily cover the whole exam material.

All lectures will be held in Middle Hall in the first 4 weeks of the module.

Laboratories

Laboratories will supplement and address practical applications of material covered in lectures. They will be held in weeks (1) - (4) as per course timetable, and in the following venues:

- Anatomy: Anatomy Lab.
- Microbiology: Middle Hall.
- Pathology: Pathology Lab.

Small Group Discussions (SGDs)

Two clinically-oriented problems will be discussed with students to learn applying basic knowledge and skills to real-life scenarios. They will be held during week (4) as per course timetable.

Research Activity

As part of the course, students are expected to take part as groups in research activities, which often take the form of written assignments on topics prespecified by the course lecturers. These subjects usually tackle practical issues in relation to the musculoskeletal and integumentary systems, and are intended to introduce students to research skills, evidence-based medicine and continuous medical education.

STUDENT GROUPING

Lectures

Students will be divided into 2 sections (A, B), each of which will have lectures as specified in the course timetable. Each section is color-coded in the timetable.

Laboratories

Each of Sections A & B (discussed above) will be divided into 4 lab groups (1 to 4), each of which will have labs as specified in the course timetable.

Small Group Discussions (SGDs)

Each of Sections A & B (discussed above) will be divided into 10 SGD groups (1 to 10). It should be noted that student grouping for SGDs is NOT the same as that for labs, therefore it is the student's responsibility to make sure to attend at the correct time and venue to avoid any confusion.

Research Activity

Students should divide themselves into groups of 10 and submit the names of each group to the course coordinators by the end of week (1). Each group will then be randomly assigned to a lecturer and a topic, and will thereafter discuss with its supervisor further arrangements in relation to the timeframe of the research activity, its format, material and so on.

Important Note

Please note that students are NOT allowed to change their assigned groups for lectures, labs or SGDs. The same applies for the students' chosen groups for research activities.

ATTENDANCE POLICY

Please note that attendance is mandatory for lectures, labs and SGDs in accordance with university regulations. For that purpose, each student will be assigned to a specific seat for the course's lectures, and these seat numbers will be announced on the deanship's bulletin board by the start of week (1) for students to check. Attendance will be taken by a representative from the deanship office, and any formal excuses should be approved by the deanship before submission to the course coordinators.

ASSESSMENT AND GRADE DISTRIBUTION

Midterm Theoretical Exam (55%)

This will cover the material in the lectures of basic sciences, and will take the form of 80 multiple-choice questions (MCQs). It will be held on Mon (06/04/2020), with the exact times and venues to be announced by the end of week (4).

Practical Exam (35%)

This will cover the material in the labs, SGDs, and the clinical specialties' lectures, and will take the form of 40 multiple-choice questions (MCQs). It will be held on Thu (09/04/2020), with the exact times and venues to be announced by the end of week (4).

Research Activity (5%)

Evaluation of Attitude and Performance (5%)

This will be based on the student's day-to-day activity and participation in the classroom.

RECOMMENDED TEXTBOOKS

Anatomy

- *Principles of Human Anatomy* by G. J. Tortora and M. Nielsen (14th edition).
- *Gray's Anatomy for Students* by R. Drake et al. (4th edition).
- *Grant's Atlas of Anatomy* by A. M. R. Agur and A. F. Dalley (14th edition).
- *Junqueira's Basic Histology: Text and Atlas* by A. Mescher (15th edition).
- *Before We Are Born: Essentials of Embryology and Birth Defects* by K. L. Moore et al. (9th edition).

Biochemistry

Harper's Illustrated Biochemistry by V. Rodwell et al. (31st edition).

Microbiology

Sherris Medical Microbiology by K. Ryan et al. (7th edition).

Pathology

Robbins Basic Pathology by V. Kumar et al. (10th edition).

Pharmacology

Lippincott Illustrated Reviews: Pharmacology by K. Whalen (7th edition).

Physiology

- *Guyton and Hall Textbook of Medical Physiology* by J. E. Hall (13th edition).
- *Ganong's Review of Medical Physiology* by K. Barrett et al. (25th edition).
- *Human Physiology: From Cells to Systems* by L. Sherwood (9th edition).

DISTRIBUTION OF LECTURES AND LABS (AS PER DISCIPLINE)

	Number of Lectures	Number of Labs
Anatomy	14	4
Physiology	3	
Biochemistry	2	
Pathology	6	2
Microbiology	4	1
Pharmacology	4	
Dermatology	1	
Orthopedics	2	
Radiology	1	
Total	37	7

LECTURE-SPECIFIC OBJECTIVES

	TOPIC	OBJECTIVES
	Introductory Lecture	Highlights features, objectives, rules and regulations of the course
1	Shoulder Girdle and Shoulder Joint (Anatomy)	<ol style="list-style-type: none"> 1. Describe the principal distinguishing features of the scapula, clavicle, and humerus 2. Discuss the intermuscular spaces related to the scapula and their contents 3. List the rotator cuff muscles 4. Axilla: Boundaries and contents 5. Describe the components of the shoulder joint 6. Describe the muscles acting on the shoulder joint according to the type and movement they perform 7. Describe the bursae in relation to the shoulder joint 8. List the blood supply and innervation of the shoulder joint
2	Resting Membrane Physiology and Action Potential Generation & Conduction (Physiology)	<ol style="list-style-type: none"> 1. Study the principles of membrane physiology in the resting state in excitable tissues (i.e. muscles and nerves) 2. Describe how an action potential is generated and propagated along the cell membrane
3	Biochemistry of Bone and Connective Tissue (Biochemistry)	<ol style="list-style-type: none"> 1. Describe the biochemical structure of bone tissue, the collagen matrix and the hydroxyapatite cement 2. List bone matrix proteins and describe their functions 3. Describe the composition of calcified tissues, calcification in bones and teeth, and formation of hydroxyapatite 4. Understand the role of alkaline phosphatase, calcium and phosphate 5. Role of vitamin D and 1,25-dihydroxyvitamin D in bone formation and remodeling 6. Review calcium and phosphate homeostasis
4	Muscles of Arm and Forearm (Anatomy)	<ol style="list-style-type: none"> 1. List the muscles attached to the arm and their attachments 2. List the muscles attached to the forearm and their attachments 3. Classify the muscles of the arm according to function 4. Classify the muscles of the forearm according to function 5. Describe the innervation of the muscles of the arm 6. Describe the innervation of the muscles of the forearm.
5	Elbow Joint and Cubital Fossa (Anatomy)	<ol style="list-style-type: none"> 1. Describe the principal distinguishing features of the radius and ulna 2. Describe the cubital fossa and its contents 3. Describe the components of the elbow joint (including the ligaments and bursae) 4. List the muscles acting on the elbow joint according to type and action 5. Describe the stability of the elbow joint 6. List the blood supply and innervation of the elbow joint

6	<p>Neuromuscular Junction (NMJ) and General Mechanism of Skeletal Muscle Contraction</p> <p>(Physiology)</p>	<ol style="list-style-type: none"> 1. Understand the sequence of events at the neuromuscular junction 2. End-plate potential: Definition and its relation to <i>miniature end-plate potential</i> 3. Understand how NMJ is turned off 4. Understand the pathophysiological basis of myasthenia gravis 5. Understand the effect of some agents on transmission at the NMJ 6. Describe the general mechanism of skeletal muscle contraction and relaxation 7. Meaning of <i>excitation-contraction coupling</i>
7	<p>Molecular Mechanism of Contraction and Its Characteristics in Skeletal Muscle</p> <p>(Physiology)</p>	<ol style="list-style-type: none"> 1. Understand the molecular structure of the skeletal muscle and its division into functional units 2. Describe the acto-myosin crossbridge cycle 3. Explain <i>rigor mortis</i> 4. Explain the muscle twitch 5. Distinguish between <i>concentric</i>, <i>eccentric</i> and <i>isometric</i> contractions 6. Describe <i>recruitment</i> and <i>tetany</i> and their effects on muscle force 7. Describe the muscle force-velocity relationship
8	<p>Hand and Wrist Joint</p> <p>(Anatomy)</p>	<ol style="list-style-type: none"> 1. Describe the principal distinguishing features of the carpus, metacarpus and phalanges 2. Describe the components of the wrist joint (including the ligaments and bursae) 3. List the muscles acting on the wrist joint according to type and action 4. List the blood supply and innervation of the wrist joint 5. Describe the carpal tunnel, flexor and extensor retinaculae, and the structures passing in relation to them 6. List the muscles acting on the fingers and their actions
9	<p>Non-Neoplastic Bone Conditions and Joint Diseases</p> <p>(Pathology)</p>	<ol style="list-style-type: none"> 1. Describe congenital and developmental conditions of bone 2. Understand distinguishing features of skeletal dysplasias (e.g. achondroplasia, osteogenesis imperfecta, osteopetrosis) 3. Describe the pathogenesis and pathologic features of osteoporosis, rickets/osteomalacia and influence of hyperparathyroidism on bone 4. Describe Paget's disease of bone 5. Describe the pathogenesis and pathologic features of osteomyelitis. 6. Describe the pathogenesis and pathologic features of joint diseases of inflammatory (e.g. rheumatoid arthritis), degenerative (e.g. osteoarthritis) and metabolic joint diseases (e.g. gout, pseudogout)

10	Gluteal Region and Hip Joint (Anatomy)	<ol style="list-style-type: none"> 1. Describe the distinguishing features of the hip bone and femur 2. List the muscles of the gluteal region 3. Describe the attachments and innervations of the gluteal region muscles 4. Describe the greater and lesser sciatic foramina and their contents 5. Describe the components of the hip joint (including the ligaments and bursae) 6. Describe the muscles acting on the hip joint according to type and action 7. Describe the blood supply and innervation of the hip joint
11	Muscles of Thigh, Femoral Triangle, and Subsartorial Canal (Anatomy)	<ol style="list-style-type: none"> 1. List the muscles of the thigh 2. Describe the attachments and innervations of the thigh muscles 3. Describe the femoral triangle 4. Describe the subsartorial canal 5. Classify the muscles of the thigh according to action
12	Knee Joint and Popliteal Fossa (Anatomy)	<ol style="list-style-type: none"> 1. Describe the distinguishing features of the tibia, fibula and patella 2. Describe the popliteal fossa and its contents 3. Describe the components of the knee joint (including the ligaments and bursae) 4. List the muscles acting on the knee joint according to type and action 5. List the blood supply and innervation of the knee joint
13	Metabolic Disorders of Muscle and Bone (Biochemistry)	<ol style="list-style-type: none"> 1. Discuss the markers for bone formation and resorption and their clinical use in diagnosis 2. Describe the molecular bases of <i>Duchenne muscular dystrophy</i>, <i>glycogen storage diseases of muscle</i>, and <i>muscle mitochondrial diseases</i> 3. Describe the molecular bases of <i>osteogenesis imperfecta</i> and <i>Ehlers-Danlos syndromes</i>
14	Bone Tumours (Pathology)	<ol style="list-style-type: none"> 1. Describe the basic principles in diagnosis of bone tumors 2. Understand the classification of bone tumors 3. Discuss the common benign bone tumors and tumor-like conditions 4. Discuss the common malignant bone tumors
15	Muscles of Leg and Ankle Joint (Anatomy)	<ol style="list-style-type: none"> 1. Describe the distinguishing features of the talus and calcaneus bones 2. Describe the components of the ankle joint 3. List the ligaments associated with the ankle joint and their attachments 4. List the muscles of the leg acting on the ankle joint according to type and action

16	Muscle Relaxants (Pharmacology)	<ol style="list-style-type: none"> 1. Know the historical background of muscle relaxants 2. Know the conditions and clinical uses of muscle relaxants. 3. Differentiate between depolarizing and non-depolarizing muscle relaxants in regards to pharmacokinetics and pharmacodynamics 4. List examples of depolarizing and non-depolarizing agents 5. Understand the mechanism of action of each drug and possible drug-drug interactions 6. Study spasmolytic drugs and their therapeutic uses
17	Soft Tissue Tumours (Pathology)	<ol style="list-style-type: none"> 1. Describe soft tissue tumors 2. Understand the classification of soft tissue tumors 3. Understand the importance of cytologic and histologic features of soft tissue tumors in identifying type and behavior 4. Discuss the commonest benign and malignant soft tissue tumors
18	Foot (Anatomy)	<ol style="list-style-type: none"> 1. Describe the distinguishing features of the tarsal metatarsal bones and phalanges 2. Describe the movement of the toes 3. List the muscles acting on the toes 4. Describe the retinaculae which related to the foot and the structures passing in relation to them 5. Describe the four muscle layers of the foot 6. Describe the arches of the foot
19	Skin Anatomy (Anatomy)	<ol style="list-style-type: none"> 1. Describe the layers of the epidermis 2. Discuss the development of integumentary system 3. Describe structure of the dermis, and compare the structure and distribution of hair follicles, nails, sebaceous and sweat glands 4. Differentiate between thick and thin skin
20	Views of Skull (Anatomy)	<ol style="list-style-type: none"> 1. Describe the antero-posterior views of the skull both internally and externally 2. Describe the lateral view of skull both internally and externally 3. Describe the supero-inferior views of skull both internally and externally 4. Describe the base of the skull with major foramina and related structures
21	Non-Neoplastic Muscle Disorders (Pathology)	<ol style="list-style-type: none"> 1. Overview the histology of skeletal muscle 2. List the main types of skeletal muscle diseases 3. Discuss the two main types of muscle atrophy 4. Discuss the main inflammatory myopathies 5. Discuss muscular dystrophy and understand the pathogenesis and pathological features of Duchenne and Becker muscular dystrophies

22	Joints of Vertebral Column and Thoracic Cage (Anatomy)	<ol style="list-style-type: none"> 1. Describe the components of the atlantooccipital and atlantoaxial joints, their ligaments, movements and stability 2. Describe the components of the intervertebral joints, their ligaments, movements and stability 3. Describe the components of the costovertebral and costosternal joints, their ligaments and movements
23	Bacterial Skin Infections (Microbiology)	<ol style="list-style-type: none"> 1. Describe the morphology of common cutaneous bacterial infections 2. Discuss the bacterial etiologies of cellulitis and erysipelas 3. Recognize clinical patterns and risk factors that suggest methicillin-resistant staphylococcus aureus (MRSA) 4. Recommend initial steps for the evaluation and treatment of common cutaneous bacterial infections 5. Recognize characteristic features of necrotizing infections
24	Viral Skin Infections (Microbiology)	<ol style="list-style-type: none"> 1. Be able to identify and manage common viral skin infections 2. Be familiar with the range of appearance of viral infections 3. Identify and manage herpes simplex infections 4. Identify and manage herpes zoster infections 5. Identify and manage viral warts
25	Skin Tumours (Pathology)	<ol style="list-style-type: none"> 1. Understand the classification of epithelial skin tumors (i.e. benign, premalignant, malignant) 2. Understand the importance of cytologic and histologic features of soft tissue tumors in identifying type and behavior 3. Discuss the commonest epithelial skin tumors 4. Understand the classification of melanocytic conditions 5. Discuss benign melanocytic tumors and malignant melanoma
26	Pharmacology of Skin: Topical Medications I (Pharmacology)	<ol style="list-style-type: none"> 1. Understand the main pharmacological differences between topical and systemic drug administration 2. Study differences between forms of topical formulation (e.g. creams, lotions, ointments) 3. Study antibacterial topical medications (e.g. Bacitracin, Polymyxin B, Neomycin, Gentamycin, Neosporin) 4. Understand the pathophysiology of acne vulgaris and its pharmacological and non-pharmacological treatment 5. Study topical and systemic antifungal medications 6. Study viral infections of the skin and its topical antiviral medication (acyclovir) 7. Study the pharmacological treatment of leprosy and scabies 8. Understand the pathophysiology of psoriasis and its management 9. Get familiar with other dermatological conditions (e.g. urticaria, eczema)
27	Muscles of Back (Anatomy)	<ol style="list-style-type: none"> 1. Describe superficial muscles of the back including their attachments 2. Describe the components of the deep muscles of the back including their attachments 3. Describe the innervations and actions of the back muscles in detail

28	Fungal and Parasitic Skin Infections (Microbiology)	<ol style="list-style-type: none"> 1. Describe the fungi that infect the skin and subcutaneous tissues, their identification and treatment (including dermatophytes, <i>Candida</i> and Mycetoma agents). 2. Describe parasites that infest the skin, their life cycles, treatment and prevention. (including leishmaniasis, cutaneous larva migrans onchocerciasis, loiasis, fleas, and scabies)
29	Embryology of MSS (Anatomy)	<ol style="list-style-type: none"> 1. Describe the development of the axial skeleton 2. Describe the development of the appendicular skeleton 3. Describe the development of the skeletal muscles 4. Describe the related congenital anomalies
30	Acute and Chronic Inflammatory Dermatoses and Blistering Skin Conditions (Pathology)	<ol style="list-style-type: none"> 1. Understand general macroscopic and microscopic terms as applied to skin lesions 2. Define etiology, pathogenesis and pathologic features of urticaria, acute eczema and erythema multiforme 3. Define etiology, pathogenesis and pathologic features of psoriasis and lichen planus 4. Define etiology, pathogenesis and pathologic features of blistering (bullous) disorders (e.g. pemphigus, bullous pemphigoid, dermatitis herpetiformis)
31	Pharmacology of Skin: Topical Medications II (Pharmacology)	See Lecture (26)
32	Anaerobes and Gas Gangrene (Microbiology)	<ol style="list-style-type: none"> 1. Describe anaerobic bacteria, including their sensitivity to oxygen and their niches within the environment and the human body 2. Give indicators of possible anaerobic infections and name the most probable etiologic agents of gas gangrene 3. Describe the microscopic and colony morphologies of anaerobes 4. Discuss antimicrobial susceptibility testing of anaerobes, including methods and antimicrobial agents to be tested 5. Describe the major approaches to treat anaerobic-associated diseases, whether medical or surgical
33	Antirheumatic Medications (Pharmacology)	<ol style="list-style-type: none"> 1. Understand the pathophysiology of osteoarthritis and rheumatoid arthritis and differentiate between them in regards to clinical picture, and goal of treatment 2. Study available medications used in the management of rheumatoid arthritis (e.g. paracetamol, NSAIDs, DMARDs) 3. Study drugs that fall in the category of disease-modifying antirheumatoid drugs (DMARDs) and their mechanism of action.

34	Introduction to Dermatology (Dermatology)	<ol style="list-style-type: none"> 1. Understand the basic anatomical and histological structure of skin layers (i.e. epidermis and dermis) and the barrier functions of skin (anatomical and immunological) 2. Understand the process of epidermal turnover and desquamation 3. Understand the basic skin lesions: Terminology of primary and secondary lesions 4. Clinical approach to patients with dermatologic disorders: Dermatologic history and clinical examination 5. Know the bed-side diagnostics in dermatology: Woods's light, KOH examination, Tzanck smear, and dermoscopy
35	Introduction to MSS Radiology (Radiology)	<ol style="list-style-type: none"> 1. X-ray technique of creating images of internal body structures 2. Develop an approach to reading bone radiographic films 3. Describe morphology of bone fractures and pathological lesions on radiographs 4. Know the role of CT scan in orthopedic practice 5. Know the role of MRI in orthopedic practice
36	Introduction to Orthopedics (Orthopedics)	
37	Trauma & Fractures (Orthopedics)	

LAB-SPECIFIC OBJECTIVES

	TOPIC	OBJECTIVES
1	Anatomy Lab 1	<ul style="list-style-type: none"> • Identify different parts of each bone in the upper limb • Identify different parts of each joint of the upper limb • Identify the normal and recognize the most frequent X-ray features of the upper limb fractures • Identify the muscles of the upper limb
2	Anatomy Lab 2	<ul style="list-style-type: none"> • Identify different parts of each bone in the lower limb • Identify different parts of each joint of the lower limb • Identify the normal and recognize the most frequent X-ray features of the lower limb fractures • Identify the muscles of the lower limb

3	Anatomy Lab 3 / Histology	<ul style="list-style-type: none"> • Video session of the histology of the skin • Microscopic identification of the following <ul style="list-style-type: none"> ◦ Thick skin and thin skin ◦ Layers of the epidermis ◦ Components of the dermis ◦ Epidermal derivatives
4	Anatomy lab 4	<ul style="list-style-type: none"> • Identify the components of the skull's bones and regions • Identify the components of the vertebral column • Identify the parts of each particular vertebra • Identify X-ray features of the vertebral column's bones • Identify superficial and deep muscles of the back
5	Pathology Lab 1	<ul style="list-style-type: none"> • Describe the morphology of the following soft tissue tumors: <ul style="list-style-type: none"> ◦ Lipoma and liposarcoma ◦ Fibromatosis ◦ Malignant fibrous histiocytoma ◦ High-grade sarcoma • Describe the morphology of the following bone tumors: <ul style="list-style-type: none"> ◦ Osteochondroma ◦ Osteosarcoma ◦ Chondrosarcoma ◦ Ewing sarcoma ◦ Giant cell tumor ◦ Metastatic carcinoma • Describe the morphology of the following conditions: <ul style="list-style-type: none"> ◦ Osteomyelitis ◦ Paget disease of bone.
6	Pathology Lab 2	<p>Describe the main morphological features of the following skin diseases:</p> <ul style="list-style-type: none"> ◦ Dermatitis and urticaria ◦ Erythema multiforme ◦ Psoriasis ◦ Lichen planus ◦ Pemphigus vulgaris ◦ Bullous pemphigoid ◦ Dermatitis herpetiformis
7	Microbiology Lab	<ul style="list-style-type: none"> • Describe specimen collection methods for wound culture • List the most common aerobic and anaerobic organisms causing infection and their laboratory identification.

Intended Learning Outcomes (ILOs)

- 1) Demonstrate a sufficient understanding of the structural organization and functions of the following systems of the human body: circulatory, respiratory, gastrointestinal, endocrine, hematopoietic & lymphatic, musculoskeletal, nervous, and genitourinary systems.
- 2) Conceptualize the cellular, molecular, genetic, and biochemical mechanisms that maintain body's homeostasis and their derangements in disease states.
- 3) Apply their knowledge of human anatomy and function to solve questions regarding major clinical cases and diseases.
- 4) Attain appropriate and systematic clinical history of different medical conditions and settings.
- 5) Demonstrate proficiency in performing clinical skills and procedures.
- 6) Perform relevant physical examination on patients professionally and ethically.
- 7) Identify the major signs and symptoms of disease states, recognizing risk factors and etiologies, in an interdisciplinary approach to differentially diagnose patients.
- 8) Order and interpret results of relevant basic diagnostic procedures, such as laboratory investigations and conventional imaging procedures.
- 9) Apply safe and accurate methods of pharmacotherapy of major disease states.

- 10) Critically appraise research studies guided by evidence-based medicine.
- 11) Demonstrate ability to work in diverse settings and communities.