

**INDEPENDENT MEDICAL COLLEGE, FSD**

**BLOCK - 2**

**MUSCULOSKELETAL & LOCOMOTION MODULE - 3**  
**CURRICULUM 2K23**  
**(Study Guide)**

**MODULAR INTEGRATED**  
**UNDERGRADUATE CURRICULUM**

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## LIST OF ABBREVIATION

ABBREVIATION	SUBJECTS
A	Anatomy
Ag	Aging
B	Biochemistry
BhS	Behavioral Sciences
C	Civics
CM	Community Medicine
C-FRC	Clinical-Foundation Rotation Clerkship
CV	Cardiovascular
ENT	Ear Nose Throat
F	Foundation
FM	Forensic Medicine
GO	Gynecology and Obstetrics
HL	Hematopoietic & Lymphatic
M	Medicine
MS	Musculoskeletal
O	Ophthalmology
P	Physiology
PA	Pathology
PE	Pediatrics
PERLs	Pediatrics
Ph	Pharmacology
Psy	Psychiatry
QI	Quran and Islamiyat
R	Radiology
Re	Respiratory
S	Surgery
SGD	Small Group Discussion

## **CURRICULUM FRAME WORK**

The framework of Curriculum 2K23 has 44 modules spanning 05 years. The horizontal integration is evident in the modular configuration where different basic disciplines approach the themes simultaneously. Modules have been structured where all the basic disciplines are represented based on their respective weightage of content. All module objectives are preceded by the recommended themes and clinical relevance. Spiral placement of the modules within the framework ensures a revisit of the basic sciences. Clinical Skills follow a spiral which is entirely skills dominant. This spiral is the core of psychomotor training. Affective training has been formally inculcated in the curricular framework. The model of PERLs has been introduced so that the yield of doctors has a strong, resilient, ethically driven character. PERLs stands for Professionalism, Ethics, Research and Leadership skills.

## **INTRODUCTION O THE STUDY GUIDE**

The purpose of the study guide is to organize lecture notes and text book material so that students can increase their comprehension and memory of large amount of information. It will provide a teaching aid to assist the students in developing reading skills.

## **INTRODUCTION TO MODULE**

The musculoskeletal system comprises the bones, muscles, cartilage, tendons, ligaments, and other connective tissues that provide the framework, support, and movement of the body. The initial learning activities will help in understanding the normal structure, development, and normal physiological mechanisms of the organs of the system. This will help in better understanding the possible pathological conditions of the system, including common injuries, diseases, and disorders that affect it, followed by discussion on some important group of drugs used for treatment and/or prevention of these conditions (administration route, mechanism of action and side effects). The impact of musculoskeletal diseases on society and the effect of ageing on occurrence of musculoskeletal diseases will be discussed. Emphasis has been given to incorporate deranged laboratory and imaging findings into the clinical problem solving.

## **MODULE COMMITTEE**

Prof. Dr. Irfan Ahmad Mughal	Anatomy (Coordinator Integrated Curriculum)
Dr. Rizwan Ahmad	Biochemistry (Module Coordinator)
Prof. Dr. Razia Rizwan	Physiology
Dr. Awais Shuja	Surgery
Dr. Baddar Bashir	Medicine
Dr. Sirda Mushtaq	Pharmacology
Dr. Shahbaz Ahmad	Community Medicine
Dr. Salma Naz	Pathology
Dr. Aslam Lodhi	Psychiatry
Dr. Taimur-ul-Hassan	Medical Education

**INDEPENDENT MEDICAL COLLEGE, FAISALABAD**  
**1<sup>ST</sup> YEAR MBBS 2025**

**TIME TABLE**

**2<sup>ND</sup> BLOCK – 3<sup>RD</sup> MODULE (MUSCULOSKELETAL & LOCOMOTION -1)**  
**08 Weeks**

Time	08:00 - 09:45	09:45 - 10:45	10:45 - 11:15	11:15 - 01:15	01:15 - 02:00	02:00 - 02:30
<b>Mon</b>	Anatomy	Physiology	<b>BREAK</b>	Anatomy	Pharmacology / Behavioral Sciences	<b>Self Directed Learning (SDL)</b>
<b>Tue</b>	Anatomy	Physiology		Anatomy	Pathology	
<b>Wed</b>	Anatomy	Physiology		Anatomy	Islamiyat / Pak Studies	
<b>Thu</b>	Anatomy	Biochemistry		Anatomy	Community Medicine	
<b>Fri</b>	Anatomy 8:00 - 08:45	Biochemistry 08:45 - 09:30	Physiology 09:30 - 10:15	PERL 10:15 - 11:00	Community Medicine 11:00 - 12:00	
<b>Sat</b>	Anatomy 08:00 - 09:45	Biochemistry 09:45 - 10:45	<b>BREAK</b>	Biochemistry 11:15 - 01:15	CFRC 01:15 - 02:00	SDL 02:00 - 02:30

The heads of the respective departments are requested to issue the departmental schedule in accordance to the time table with intimation to the undersigned.

## **DISTRIBUTION OF TEACHING HOURS**

Modules weeks	08
Recommended Minimum Hours	236 hr
Anatomy	138 hr
Physiology	34 hr
Biochemistry	34 hr
Pathology	07 hr
Community Medicine	16 hr
Pharmacology	04 hr
Behavioral Sciences	03 hr
CFRC	08 hr
PERL	08 hr

## **MODULE OUTCOMES**

1. Develop an understanding of the fundamental components of the musculoskeletal system.
2. Explain the development of the structure & function of the musculoskeletal (MSK) components of limbs, back & correlate it with organization and gross congenital anomalies of the limbs.
3. Identify the anatomical features of bones, muscles & neurovascular components of the limbs with clinical correlation.
4. Describe how injury and disease alter the MSK structure & function.
5. Integrate concepts relating to various metabolic processes, their disorders and relevant lab investigations in the study of human MSK system.
6. Describe the role of the limbs (upper/lower) in musculoskeletal support, stability, and movements.
7. Describe the types, formation, stability, function & clinical significance of joints of the upper and lower limb.
8. Describe the basic histology of muscle fibers including their molecular structure (Sarcomere).

**LEARNING OBJECTS**  
**BLOCK 2 – MUSCULOSKELETAL & LOCOMOTION MODULE -3**

<b>ANATOMY</b>	
<b>COURSE OBJECTIVES</b>	<b>TEACHING STRATEGIES</b>
<b>THEORY</b>	
<b>SPECIFIC LEARNING OUTCOMES</b>	
<b>GROSS ANATOMY - UPPER LIMB</b>	
Describe the topographical anatomy of Pectoral Region	SGD
Perform dissection of the Pectoral Region or use models to identify the key structures	SGD
Describe muscles of the Pectoral Region with their origin, insertion, nerve supply and actions.	SGD
Describe the fasciae, cutaneous nerves. and blood vessels of the Upper Limb. Describe the extent, attachments, and structures passing through Clavipectoral Fascia	SGD
Describe the extent, structure, neurovascular supply, lymphatic drainage of Breast (Mammary Glands)	SGD
Define the boundaries of Triangle of Auscultation and state its clinical significance	SGD
Demonstrate palpation of breast and define its relation to the Fibrous septa in Carcinoma of Breast	SGD
Explain the anatomical basis of position adopted for breast examination and mammography.	SGD
Describe the osteology of the bones in pectoral region. Enumerate the muscles of pectoral girdle. Describe the attachments of muscle of pectoral girdle, nerve supply and actions (Pectoralis Major and minor, Subclavius, Trapezius, Latissimus Dorsi, Rhomboid major and minor, Levator Scapulae and Serratus anterior) Explain the role of muscles of pectoral region in stabilizing the pectoral girdle. Describe the triangle of auscultation. Mention the neurovascular supply of pectoral region and Correlate with important clinical conditions. Describe muscles of the back with their origin, insertion, nerve supply and actions.	SGD
Describe the Osteology of Clavicle (morphological features, side determination, attachments, ossification)	SGD
Describe the functions of Clavicle in terms of weight transmission of upper limb	SGD
Describe the Osteology of Scapula (morphological features, attachments,	SGD

ossification)	
Determine the side and identify the landmarks of scapula	SGD
Describe the movements of Scapula associated with movements of Shoulder Girdle	SGD
Tabulate the movements of scapula with muscles acting on it	SGD
Tabulate the attachments, origin, insertion, innervation, and actions of Anterior Axio-appendicular Muscles	SGD
Describe the Sternoclavicular Joint in terms of articulating surfaces, ligaments, articular disc, nerve supply, blood supply, axes and planes of movements and stability factors.	SGD
Develop clear concepts of the topographical anatomy of Axilla and its contents	SGD
Describe the boundaries of Axilla. (Identification of muscles forming the boundaries of axilla)	SGD
List the contents of Axilla	SGD
Perform dissection/ Identify the Axilla and its contents	SGD
Describe Axillary Artery with reference to its 3 parts – their relations, branches, and anastomosis	SGD
Describe the formation, tributaries, and drainage of Axillary Vein	SGD
Identify and demonstrate the course/ relation and branches/tributaries of axillary vessels	SGD
Describe the Axillary Lymph Nodes in terms of location, grouping, areas of drainage and clinical significance	SGD
Describe the course, relations, root value and distribution of cutaneous nerves	SGD
Describe the Osteology of Humerus (Side Determination, morphological features, attachments, ossification)	SGD
Describe the Shoulder Joint under the following headings: Articulation, Type/ Variety, Capsule, Ligaments, Innervation, Blood supply, Movements.	SGD
Describe the 3 parts of Deltoid Muscle and correlate them with its unique functions. Explain its role in abduction of shoulder joint. Explain mechanism of Abduction of arm	SGD
Identify and demonstrate the movements of Axio-appendicular Muscles on Skeleton/Model	SGD
Draw and label the arterial anastomosis around shoulder joint	SGD
Describe, in detail, the Scapula-Humeral Mechanism in relation to movement of abduction. Discuss important clinical conditions	SGD
Describe Rotator Cuff Muscles, state their Anatomical significance and explain Rotator Cuff Tendinitis	SGD
Describe Frozen Shoulder in relation to anatomical features.	SGD
Describe the formation of Brachial Plexus; Infra and Supraclavicular parts. Discuss Brachial plexus injuries	SGD
Demonstrate and identify the formation of brachial plexus and its	SGD

branches	
List the branches of brachial plexus and give their areas of distribution and muscles they innervate	SGD
Develop clear concepts of the topographical anatomy of Scapular Region	SGD
Tabulate the attachments, innervation, and actions of muscles of Scapular Region	SGD
Identify & Describe Musculocutaneous Nerve in terms of its Origin, Course, Termination, Relations, Branches, and distribution. Describe and illustrate the cutaneous innervation of the arm.	SGD
Describe the Brachial Artery in terms of its course, relations, branches, and distribution	SGD
Tabulate the attachments, innervation, and actions of Triceps brachii as a muscle of Posterior Fascial Compartment of Arm	SGD
Identify & Describe the Profunda Brachii Artery giving its course, relations, branches, and distribution	SGD
Describe Cubital Fossa with emphasis on its boundaries, contents, and clinical significance	SGD
Demonstrate surface marking of superficial veins of arm and forearm for IV injections	SGD
Determine the side and identify the landmarks of radius and ulna	SGD
Describe the Osteology of Radius (Side Determination, morphological features, attachments, ossification)	SGD
Describe the Osteology of Ulna (Side Determination, morphological features, attachments, ossification)	SGD
Describe in detail, the features of each flexor muscle of forearm, proximal & distal attachments, relations, and actions. Describe the action of paradox with examples	SGD
Tabulate the attachments, innervation, and actions of Extensor Muscles of the Forearm	SGD
Describe in detail, the features of each muscle of extensor compartment of forearm, proximal & distal attachments, relations, and actions with nerve supply.	SGD
Identify the muscles and neurovasculature of flexor and extensor compartments of forearm	SGD
Develop clear concepts of the topographical anatomy of Forearm	SGD
Describe and illustrate the cutaneous innervation of the Forearm	SGD
Compartmentalize the forearm and give its anatomical basis.	SGD
Tabulate the attachments, innervation, and actions of Flexor & Pronator Muscles of the Forearm	SGD
Identify the Extensor & Flexor Retinacula and describe their attachments and relations	SGD
Demonstrate the formation of carpal tunnel and identify the contents	SGD
Describe Carpel Tunnel Syndrome	SGD
Describe the features, attachments, relations and structures passing under Flexor Retinaculum	SGD

Describe the Origin, Course, Relations, and branches of Ulnar Artery in Forearm	SGD
Describe the Origin, Course, Relations and list the tributaries of veins of Forearm	SGD
Surface marking of Brachial artery, Cephalic, Median cubital, Basilic Vein, Radial & Ulnar arteries, anterior & posterior interosseous artery	SGD
Describe the Elbow Joint in terms of articular surfaces, type, variety, ligaments, muscles producing movements, blood supply {Anastomosis around elbow joint}, nerve supply and radiological imaging.	SGD
Describe Carrying Angle and justify its importance in limb movement	SGD
Describe the Radioulnar Joints in terms of articular surfaces, type, variety, ligaments, muscles producing movements, blood supply, nerve supply and radiological imaging.	SGD
Demonstrate mechanisms of movements of Pronation & Supination	SGD
Describe the features of Interosseous Membrane with structures that pierce through it	SGD
Describe the features and explain the importance of Fibrous Flexor Sheaths, synovial flexor sheaths and extensor expansion	SGD
Demonstrate the attachments and actions of the muscles of hand	SGD
Identify the muscles and neurovasculature of the palm	SGD
Explain the morphology and tabulate the attachments, innervation, and actions of Intrinsic Muscles of the Hand	SGD
Demonstrate the various grips. Explain the mechanism of writing	SGD
Describe the Radial Artery's course, relations and termination in hand with its clinical significance in the region	SGD
Describe the Ulnar Artery's course, relations, and termination in hand with its clinical significance in the region	SGD
Describe the formation, branches, and areas of distribution of Superficial and Deep Palmar Arch	SGD
Describe the course, relations, and branches of Ulnar, Median and Radial Nerves in the Hand	SGD
Describe the First Carpometacarpal Joint in terms of; Type, Variety, Articular Surfaces, Ligaments, Relations, Blood Supply, Innervation, movements.	SGD
Demonstrate the movements of the 1st carpometacarpal joint	SGD
Describe the Metacarpophalangeal & interpharyngeal Joints in terms of; Type, Variety, Articular Surfaces, Ligaments, Relations, Blood Supply, Innervation & Movements	SGD
Palpate the arteries of the upper limb on a subject	SGD
Identify the topographical features of upper limb in a cross-sectional model/ specimen.	SGD
Demonstrate and identify the anatomical landmarks of upper limb on radiographs/ CT/ MRI	SGD
Mark the anatomical landmarks on a subject/ simulated model	SGD

<b>GROSS ANATOMY</b>	<b>-</b>	<b>LOWER LIMB</b>	
<b>SPECIFIC LEARNING OBJECTIVES</b>			
Draw and label the Parts of the hip bone, with its attachments,			SGD
Describe the parts, attachments, and ossification of hip bone			SGD
Identify the parts and bony features of the hip bone, with its attachments, important relations			SGD
Demonstrate the side determination of hip bone, its bony features, attachments, sex differences, and important relations			SGD
Describe the parts, attachments, ossification, side determination, and Sex differences of femur			SGD
Identify the parts and bony features of the femur, with its attachments, important relations.			SGD
Demonstrate the side determination of femur, its bony features, attachments, and important relations (correlate these with fractures)			SGD
Describe the extent, attachments, and modifications of Fascia Lata			SGD
Demonstrate the attachment of fascia Lata, iliotibial tract			SGD
Describe the cutaneous nerves and vessels of thigh			SGD
Draw and label the cutaneous nerve supply of thigh			SGD
Describe the formation, course, relations, tributaries, and termination of the superficial veins			SGD
Explain the anatomical justification of venesection, varicose veins, and saphenous venous grafts			SGD
Describe the lymphatic drainage of the region with special emphasis on afferent and efferent of inguinal lymph nodes			SGD
Identify the superficial and deep lymph nodes			SGD
Explain the anatomical justification for enlargement of inguinal lymph nodes			SGD
Describe and identify the Boundaries and contents of femoral triangle			SGD
Draw and label the Boundaries and contents of femoral triangle			SGD
Identify the femoral sheath with its compartments			SGD
Describe the formation of femoral sheath and its significance			SGD
Describe the formation of femoral canal and its contents and significance			SGD
Describe the formation and significance of femoral ring			SGD
Compare and contrast the anatomical features of femoral and inguinal hernias			SGD
Describe the Muscles of anterior compartment of thigh with their proximal and distal attachments, actions, and innervations			SGD
Demonstrate and identify the muscles of anterior compartment of thigh with their proximal and distal attachments			SGD
Demonstrate the actions of muscles of anterior compartment of thigh			SGD
Explain the anatomical basis of psoas abscess			SGD
Identify and demonstrate the nerves and vessels of anterior compartment of thigh along with their branches			SGD
Describe the origin, course, relations, branches, distribution, and termination of femoral artery			SGD

Describe the origin, course, relations, tributaries, area of drainage and termination of femoral vein	SGD
Describe the origin, course, relations, branches, distribution, and termination of femoral nerve	SGD
Tabulate the muscles of anterior compartment of thigh with their attachments, nerve supply and actions	SGD
Describe the formation, boundaries, contents, and significance of adductor canal	SGD
Identify and demonstrate the boundaries and contents of adductor canal	SGD
Describe Muscles of medial compartment of thigh with their proximal and distal attachments, innervation and actions	SGD
Identify the muscles of medial compartment of thigh with their proximal and distal attachments	SGD
Demonstrate the actions of the muscles of the compartment on self/ subject	SGD
Describe the origin, course, relations, branches/ tributaries, distribution, and termination of neurovascular structures of medial compartment of thigh	SGD
Identify the nerves and vessels of medial compartment of thigh along with their branches	SGD
Describe and identify the lumbar and sacral plexus and its branches supplying the lower limb	SGD
Describe the cutaneous nerve supply and lymphatics of the region	SGD
Describe the subcutaneous tissue of gluteal region	SGD
List the structures passing through the greater and lesser sciatic foramen.	SGD
Describe the muscles of gluteal region with their proximal and distal attachments, innervation, and actions	SGD
Identify the muscles of gluteal region with their proximal and distal attachments	SGD
Describe the origin, course, relations, branches/ tributaries, distribution, and termination of neurovascular structures of gluteal region	SGD
Demonstrate the actions of the muscles of gluteal region	SGD
Draw and label the cruciate and trochanteric anastomosis	SGD
Explain the anatomical basis of the consequences of wrongly placed gluteal intramuscular injections and injury to superior and inferior gluteal nerves	SGD
Demonstrate and identify the origin, course, relations, branches/tributaries and termination of nerves and vessels of gluteal region	SGD
Describe the Attachments of muscles of posterior compartment of thigh with the innervation and action	SGD
Identify the muscles of posterior compartment of thigh with their proximal and distal attachments	SGD
Demonstrate the actions of muscles of posterior compartment of thigh	SGD
Describe the anatomical basis of signs and symptoms of Piriformis syndrome	SGD

Describe the origin, course, relations, branches, distribution, and termination of Profunda femoris artery	SGD
Describe the formation and distribution of chain anastomoses of thigh (and its clinical significance)	SGD
Describe the origin, course, relations, branches, distribution, and termination of sciatic nerve	SGD
Describe the anatomical basis of signs and symptoms of compression of or injury to sciatic nerve	SGD
Describe the hip joint with its type, articulations, ligaments, stabilizing factors, movements, and neuro-vascular supply with clinical significance.	SGD
Perform the movements of hip joint at various angles and be able to describe the muscles producing the movement. Discuss important associated clinical conditions.	SGD
Describe the Boundaries, relations, and contents of popliteal fossa	SGD
Draw and label boundaries, relations, and contents of popliteal fossa	SGD
Identify the boundaries and contents of popliteal fossa	SGD
Describe the origin, course, relations, branches/tributaries, distribution and termination of popliteal artery and vein	SGD
Enlist the bones in the knee joint	SGD
Describe parts of tibia and fibula, with their attachments, important relations, ossifications, and side determination	SGD
Identify the parts and bony features of the tibia & fibula, their bony features, attachments, important relations.	SGD
Describe the anatomical basis for using fibula as graft	SGD
Describe the attachments and role of popliteus in locking and unlocking of the knee joint	SGD
Draw and label Parts of patella with its attachments	SGD
Describe features and ossification of patella,	SGD
Enlist the factors responsible for stabilizing the patella	SGD
Describe the knee joint with its type, articulations, ligaments, movements, and neuro-vascular supply	SGD
Explain the mechanism of locking and unlocking of knee joint with the foot on ground and off the ground	SGD
Describe the factors responsible for stability of knee joint. Discuss important associated clinical conditions.	SGD
Describe the Muscles of anterior, lateral, and posterior compartments of leg with their proximal & distal attachments, innervation, and actions	SGD
Identify the muscles of anterior, lateral, and posterior compartments of leg with their proximal and distal attachments	SGD
Describe the origin, course, relations, branches/tributaries and termination of nerves and vessels of anterior, lateral, and posterior compartments of leg	SGD
Describe the cutaneous nerves and vessels of leg.	SGD
Draw and label the cutaneous nerve supply and dermatomes of leg	SGD
Identify the extensor, flexor, and peroneal retinacula and demonstrate the	SGD

structures related to them	
Describe the attachments, relations, and structures passing under cover of, extensor, peroneal, and flexor retinacula	SGD
Identify and demonstrate the nerves and vessels of anterior, lateral, and posterior compartments of leg along with their branches	SGD
Describe the formation of noncalcaneous (Achilles tendon)	SGD
Describe the articulations, muscles and neurovasculature and movements at Tibio-fibular joints	SGD
Describe the ankle joint with its type, articulations, ligaments, movements, and neuro-vascular supply	SGD
Describe the factors stabilizing the ankle joint. Discuss important associated clinical conditions.	SGD
Identify and demonstrate the articulating surfaces and ligaments of ankle joint	SGD
Describe the formation, attachments, and clinical significance of plantar Aponeurosis	SGD
Explain the anatomical basis of the signs and symptoms of plantar fasciitis.	SGD
Identify the parts and bony features, attachments, and important relations of the articulated foot	SGD
Describe the muscles of the dorsum and sole of foot with their proximal & distal attachments, innervation and actions emphasizing the role of interossei and lumbricals.	SGD
Draw and label the muscles of the layers of sole of foot	SGD
Demonstrate and identify the muscles and tendons with their proximal and distal attachments in the sole of foot	SGD
Describe the interphalangeal, subtalar and midtarsal joints with their types, articulation, ligaments, stabilizing factors, movements, and neurovascular supply	SGD
Describe the formation, components, stabilizing and maintaining factors of the arches of foot	SGD
Describe the clinical significance of arches of foot with respect to flat foot, claw foot.	SGD
Describe the fibrous flexor sheaths, extensor expansions and synovial flexor sheaths	SGD
Describe the origin, course, relations, branches/tributaries, distribution, and termination of plantar vessels	SGD
Identify the nerves and vessels on the foot along with their branches	SGD
Describe the cutaneous nerves and vessels of foot	SGD
Draw and label the cutaneous nerve supply and dermatomes of foot	SGD
Identify the nerves and vessels in the sole of foot along with their branches	SGD
Describe the palpation of dorsalis pedis artery & explain the clinical significance of dorsalis pedis artery	SGD
Describe the surface anatomy, course, relations, tributaries, and	SGD

communications of the superficial and deep veins of the lower limb	
Draw a concept map of the superficial and deep veins of lower limb	SGD
List the factors favoring venous return of the lower limb	SGD
Explain the anatomical basis of the formation, and signs and symptoms of deep venous thrombosis	SGD
Describe the anatomical basis of knee jerk, ankle jerk, and plantar reflex	SGD
Describe the mechanism of walking	SGD
Describe the phases of gait cycle with muscles involved in each phase	SGD
Describe the propulsive and shock-absorbing mechanisms of foot	SGD
Describe the weight bearing/ line of weight transmission in lower limb	SGD
Draw a concept map of the lymphatic drainage of lower limb	SGD
Draw and label the cutaneous nerves & dermatomes of the lower limb	SGD
Demonstrate the surface marking of nerves and vessels of lower limb	SGD
Demonstrate the surface marking of bony landmarks of lower limb	SGD
Identify the topographical features of lower limb in a cross-sectional model	SGD
Demonstrate and identify the features of bones and joints of lower limb on radiograph/ CT scan/ MRI	SGD
Describe the common fractures of the following bone with the risk factors, clinical presentations, and management: <ul style="list-style-type: none"> <li>• Clavicle</li> <li>• Humerus</li> <li>• Radius</li> <li>• Ulna</li> <li>• Small bones of hand</li> <li>• Hip bone.</li> <li>• Femur</li> <li>• Tibia</li> <li>• Fibula</li> <li>• Small bones of foot</li> </ul>	SGD
Describe the dislocations of the following joints with the risk factors and clinical presentations, and brief management: <ul style="list-style-type: none"> <li>• Shoulder joint</li> <li>• Elbow joint</li> <li>• Interphalangeal joint of hand</li> <li>• Hip joint</li> <li>• Knee joint</li> <li>• Ankle joint</li> </ul>	SGD
<b>EMBRYOLOGY &amp; POST-NATAL DEVELOPMENT</b>	
<b>SPECIFIC LEARNING OBJECTIVES</b>	
Name the molecular and genetic factors involved in the development of musculoskeletal system	Interactive Lectures
Describe the development of skeletal muscle	Interactive Lectures
List the derivatives of epaxial and hypaxial musculature of limb	Interactive Lectures

Briefly discuss the development of cardiac and smooth muscle (Detail to be covered in respective modules later).	Interactive Lectures
Describe the developmental basis of myotome	Interactive Lectures
Draw a concept map highlighting the sequence of events pertaining to smooth/ cardiac/ skeletal muscles	Interactive Lectures
List the factors contributing to the development of limb	Interactive Lectures
Describe the role of AER and Zone of polarizing activity in development of limb	Interactive Lectures
Describe the process of limb development and limb growth	Interactive Lectures
Draw a concept map pertaining to development of limb	Interactive Lectures
Compare and contrast the development of upper limb with the development of lower limb	Interactive Lectures
Describe the embryological basis of cutaneous innervation of limb	Interactive Lectures
Describe the embryological basis of blood supply of limbs and concept of axial artery	Interactive Lectures
Describe the embryological basis of congenital anomalies related to muscular system.	Interactive Lectures
Describe the clinical presentations and embryological basis of 1. Amelia 2. Meromelia 3. Phocomelia 4. Split-Hand/Foot Malformations 5. Polydactyly, Brachydactyly, Syndactyly 6. Congenital club foot	Interactive Lectures
Describe the developmental process of cartilage and bone	Interactive Lectures
Describe the process of histogenesis of cartilage and bone	Interactive Lectures
Describe the developmental process of intramembranous and endochondral ossification	Interactive Lectures
List the factors contributing to the development of Axial skeletal system	Interactive Lectures
Describe the clinical picture and explain the embryological basis of Axial skeletal anomalies	Interactive Lectures
Describe the developmental process of Vertebral Column	Interactive Lectures
<b>MICROSCOPIC ANATOMY</b>	
<b>SPECIFIC LEARNING OBJECTIVES</b>	
Describe the microscopic structure and ultra-microscopic structure of skeletal muscle	Interactive Lectures
Explain the basis of myasthenia gravis and Duchenne muscular dystrophy	Interactive Lectures
Describe the microscopic and ultramicroscopic structure of cardiac muscle	Interactive Lectures
Describe the microscopic and ultramicroscopic of smooth muscle	Interactive Lectures
Compare and contrast the histological features of three types of muscle tissue	Interactive Lectures
Describe the regeneration of muscle, hyperplasia, and hypertrophy of muscle fiber	Interactive Lectures
Explain the histopathological basis of leiomyoma	Interactive Lectures
Describe the histological basis of Duchenne Muscular Dystrophy	Interactive Lectures

Describe the light and electron microscopic structure of bone cells	Interactive Lectures
Describe the histological justification for osteoporosis, osteopenia.	Interactive Lectures
Describe the histological basis for bone repair after fractures.	Interactive Lectures
Describe the light and electron microscopic structure of compact and spongy bone	Interactive Lectures
Compare and contrast the microscopic features of compact and spongy bone	Interactive Lectures
Draw a concept map to explain the characteristic features of ossification	Interactive Lectures
Draw and label the zones seen in an epiphyseal growth plate	Interactive Lectures
Describe the metabolic role of bone	Interactive Lectures
Describe the clinical presentation of osteoporosis, osteopenia	Interactive Lectures
Describe the microscopic and ultramicroscopic structure of all types of cartilage	Interactive Lectures
Compare and contrast the structure of cartilage and bone matrix	Interactive Lectures
Tabulate the differences between three types of cartilage	Interactive Lectures
Describe the histological basis for bone & Cartilage growth and repair	Interactive Lectures
<b>PRACTICAL</b>	
<b>SPECIFIC LEARNING OBJECTIVES</b>	
<b>Histology</b>	
Draw and label the histology of skeletal muscle	SGD/ Practical
Draw and label the histology of smooth muscle	SGD/ Practical
Draw and label the histology of cardiac muscle	SGD/ Practical
Draw and label the histological picture of compact bone	SGD/ Practical
Draw and label the histological picture of spongy bone	SGD/ Practical
Draw and label the microscopic structure of hyaline cartilage	SGD/ Practical
Draw and label the microscopic structure of elastic cartilage	SGD/ Practical
Draw and label the microscopic structure of fibro cartilage	SGD/ Practical

<b>PHYSIOLOGY</b>		
<b>LEC. NO</b>	<b>LEARNING OBJECTIVES</b>	<b>TEACHING STRATEGIES</b>
1	Explain the Physiological basis of membrane potential	Interactive Lectures
2	Explain diffusion potentials of Na & K	Interactive Lectures, SGD
3	Define Nernst potential	Interactive Lectures, SGD
4	Explain Physiological Basis of Nernst potential	Interactive Lectures, SGD
5	Write the Nernst equation.	Interactive Lectures, SGD, Tutorial
6	Calculate Nernst potential for Na & K	Interactive Lectures
7	Explain the effects of altering the concentration of Na <sup>+</sup> , K <sup>+</sup> , Ca on the equilibrium potential for that ion	Interactive Lectures, SGD
8	Describe the normal distribution of Na <sup>+</sup> , K <sup>+</sup> , Ca and Cl <sup>-</sup> across the cell membrane	Interactive Lectures, SGD
9	Explain physiological basis of Goldman equation	Interactive Lectures, SGD

10	Clarify the role of Goldman equation in generation of RMP.	Interactive Lectures, SGD
11	Describe the Physiological basis of generate on of RMP.	Interactive Lectures, Tutorial
12	Explain the effects of hyperkalemia and Hypokalemia on the RMP	Interactive Lectures, SGD
13	Name the membrane stabilizers	Interactive Lectures, SGD
14	Explain the physiological basis of action of Local Anesthetics.	Interactive Lectures, SGD
15	Describe the Physiological anatomy of Neurons	Interactive Lectures, SGD
16	Discuss the axonal transport	Interactive Lectures, SGD
17	Enlist & give functions of Neuroglial cells	Interactive Lectures, SGD
18	Explain process of myelination in CNS & PNS	Interactive Lectures, SGD
19	Classify neurons functionally.	Interactive Lectures, SGD
20	Classify nerve fibers according to Erlanger & Gasser Classification	Interactive Lectures, SGD
21	Define Action Potential	Interactive Lectures, SGD
22	Enlist the Properties of action potential	Interactive Lectures, SGD
23	Describe the ionic basis of an action potential.	Interactive Lectures, SGD
24	Explain the phases of action potential.	Interactive Lectures, SGD
25	Explain the effects of hyperkalemia and Hypokalemia on the action potential.	Interactive Lectures, SGD
26	Draw monophasic action potential.	Interactive Lectures, SGD
27	Explain absolute and relative refractory period	Interactive Lectures, SGD
28	Explain the role of other ions in action potential.	Interactive Lectures, SGD
29	Elaborate the effect of hypocalcaemia on neuron excitability.	Interactive Lectures, SGD
30	Explain Physiological basis & properties of Graded potential	Interactive Lectures, SGD
31	Draw & explain Physiological basis & properties of compound action potential.	Interactive Lectures, SGD
32	Contrast between action potential and graded potential	Interactive Lectures, SGD
33	Describe the ionic basis of excitatory post synaptic potential (EPSP), inhibitory postsynaptic potential (IPSP), endplate potential (EPP).	Interactive Lectures, SGD
34	Classify and explain Physiological basis of different types of synapses	Interactive Lectures, SGD
35	Elaborate how signal transmission takes place Across chemical synapse	Interactive Lectures, SGD
36	Explain the mechanism of conduction of Nerve impulse in	Interactive Lectures, SGD

	myelinated and unmyelinated nerve fibers.	
37	Elaborate significance of salutatory conduction	Interactive Lectures, SGD
38	Enlist the types of nerve injury	Interactive Lectures, SGD
39	Explain Wallerian degeneration.	Interactive Lectures, SGD
40	Describe the process of regeneration of nerve fiber.	Interactive Lectures, Tutorial
41	Describe the causes, features & pathophysiology of Multiple sclerosis, GB syndrome.	Interactive Lectures, Tutorial
42	Discuss the physiological anatomy of skeletal muscles.	Interactive Lectures, Tutorial
43	Differentiate b/w skeletal, smooth, and cardiac muscle	Interactive Lectures, Tutorial
44	Describe the structure of Sarcomeres	Interactive Lectures, SGD
45	Differentiate between isometric and isotonic Contraction by giving examples.	Interactive Lectures, SGD
46	Compare the fast and slow muscle fibers.	Interactive Lectures, SGD
47	Explain the mechanism of summation and Tetanization.	Interactive Lectures, SGD
48	Describe staircase effect / Treppe phenomena	Interactive Lectures, SGD
49	Discuss the mechanism of skeletal muscle fatigue.	Interactive Lectures, SGD
50	Describe the physiological anatomy of NMJ	Interactive Lectures, SGD
51	Mechanism of Neuromuscular transmission & Generation of End Plate Potential	Interactive Lectures, SGD
52	Explain features, pathophysiology & treatment of myasthenia Gravis	Interactive Lectures, SGD
53	Discuss the steps/events of excitation contraction coupling in skeletal muscle.	Interactive Lectures, SGD
54	Differentiate between types of smooth muscles.	Interactive Lectures, SGD
55	Describe mechanism of smooth muscle contraction in comparison to skeletal muscle.	Interactive Lectures, SGD
56	Explain the physiological anatomy of neuromuscular junction of smooth muscle	Interactive Lectures, SGD
57	Explain the types of action potential in smooth muscles.	Interactive Lectures, SGD
58	Explain the LATCH mechanism	Interactive Lectures, SGD
59	Describe the significance of LATCH mechanism.	Interactive Lectures, SGD
60	Explain the nervous and hormonal control of Smooth Muscle	Interactive Lectures, SGD

	Contraction.	
61	Enlist various types of muscle disorders	Interactive Lectures, SGD
62	Describe the pathophysiology & features of muscular dystrophy.	Interactive Lectures, SGD
63	Define Myopathy	Interactive Lectures, SGD
64	Enlist various causes of myopathy	Interactive Lectures, SGD
65	Outline management of myopathy	Interactive Lectures, SGD
66	Define osteoporosis	Interactive Lectures, SGD
67	Identify risk factors for osteoporosis	Interactive Lectures, SGD
68	Outline management strategies	Interactive Lectures, SGD
69	Define Osteomalacia	Interactive Lectures, SGD
70	Identify risk factors for osteomalacia	Interactive Lectures, SGD
71	Outline management strategies	Interactive Lectures, SGD

<b>BIOCHEMISTRY</b>		
<b>LEC. NO</b>	<b>LEARNING OBJECTIVES</b>	<b>TEACHING STRATEGIES</b>
1	Classify amino acids based on polarity, nutritional importance, and glucogenic / Ketogenic properties	Interactive Lectures
2	Explain the structure, physical, chemical properties of amino acids and their biomedical importance	Interactive Lectures, SGD
3	Classify proteins based on functions and physicochemical properties.	Interactive Lectures, SGD
4	Explain its biomedical importance	Interactive Lectures, SGD
5	Distinguish between class A and B proteins.	Interactive Lectures, SGD, Tutorial
6	Discuss structure and functions of Fibrous proteins (collagen and Elastin)	Interactive Lectures, SGD
7	Interpret diseases associated with them on basis of sign/symptoms and data	Interactive Lectures, SGD
8	Explain the structural levels of proteins	Interactive Lectures, SGD
9	Differentiate between alpha helix and beta pleated protein structures	Interactive Lectures, SGD
10	Identify bondings at different levels of proteins	Interactive Lectures, SGD
11	Describe the role of chaperons in protein folding.	Interactive Lectures, SGD
12	Interpret disorders related to protein misfolding on basis of given data	Interactive Lectures, SGD
13	Describe the biochemical basis of Alzheimer's disease/ prion disease	Interactive Lectures, SGD
14	Describe biomedical importance of Mono-, Oligo and Polysaccharides.	Interactive Lectures, SGD

15	Discuss isomerization of carbohydrates	Interactive Lectures, SGD
16	Explain physical and chemical properties of carbohydrates	Interactive Lectures, SGD
17	Differentiate proteoglycan and glycoprotein and explain their functions	Interactive Lectures, SGD
18	Describe the components of extracellular matrix.	Interactive Lectures, SGD
19	Describe the sources, metabolism, and biochemical functions of vitamin C	Interactive Lectures, SGD
20	Describe structure, functions, and clinical significance of glycosaminoglycans.	Interactive Lectures, SGD
21	Interpret the importance of vitamin C in collagen synthesis.	Interactive Lectures, SGD
22	Identify the defects in collagen synthesis based on given data. (Osteogenesis Imperfecta)	Interactive Lectures, SGD
23	Explain dietary sources, metabolism and biochemical functions of vitamin D	Interactive Lectures, SGD
24	Interpret Rickets and osteomalacia on basis of sign. Symptoms and clinical data	Interactive Lectures, SGD
25	Explain dietary sources, metabolism and biochemical functions of calcium and phosphate	Interactive Lectures, SGD
26	Discuss regulation of calcium metabolism in bone metabolism and role of parathyroid and calcitriol in it	Interactive Lectures, SGD
27	Interpret hyper and hypocalcemic conditions on basis of sign/symptoms and clinical data	Interactive Lectures, SGD
28	Interpret genetic basis of Duchene muscular dystrophy	Interactive Lectures, SGD

<b>PRACTICAL</b>			
	<b>BIOCHEMISTRY PRACTICAL</b>	<b>Total Hours = 10</b>	
	<b>SPECIFIC LEARNING OBJECTIVES</b>	<b>DISCIPLINE</b>	<b>TOPIC</b>
1	Detection of amino acids by paper chromatography.	Medical Biochemistry	Chromatography
2	Estimation of total proteins by kit method/dipstick methods.		Total proteins
3	Estimation of albumin and globulin		Albumin/ globulin
4	Detection of calcium by micro lab		Calcium
5	Prepare different types of solution Molar, Molal, Normal and percentages.		Solutions

<b>PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS</b>	
<b>THEORY</b>	
<b>LEARNING OBJECTIVES</b>	<b>TEACHING STRATEGIES</b>
Explain the mechanism by which drugs can stimulate NMJ.	Lectures
Explain the mechanism by which drugs can block NMJ.	Lectures

Outline the pharmacological concepts of drugs used in Myasthenia gravis	Lectures
Outline the pharmacological concepts of drugs used as local anesthetics.	Lectures
Describe the hyperplasia, hypertrophy, and atrophy of muscle fiber	Lectures
Explain the histopathological basis of leiomyoma	Lectures
Describe the histological basis of Duchenne Muscular Dystrophy	Lectures
Describe the histopathological basis and clinical presentation of Alzheimer's Disease, Multiple Sclerosis and Astrocytoma	Lectures
Describe the clinical presentation and histological justification for osteoporosis, osteopetrosis	Lectures
Describe the histological basis for bone repair after fractures	Lectures
Describe the histological basis for cartilage growth and repair	Lectures

## AGING

AGING	
THEORY	
LEARNING OBJECTIVES	TEACHING STRATEGIES
Discuss the effect of age on bone fragility and its implications with management.	Lectures
Discuss the effect of age on loss of cartilage resilience and its implications and management	Lectures
Discuss the effect of age on Muscular strength and its implications and management	Lectures
Explain the protective effect of estrogen (female sex hormone) on bone mineral density and relate it to increased prevalence of postmenopausal fractures in women.	Lectures

## DISEASE PREVENTION AND IMPACT

DISEASE PREVENTION AND IMPACT	
THEORY	
LEARNING OBJECTIVES	TEACHING STRATEGIES
Explain causes of low back pain	Lectures
Describe prevention of low back pain	Lectures
Describe causes and prevention of musculoskeletal disorders (MSD) related to child labour	Lectures
Describe work related musculoskeletal disorders addition with its burden/epidemiology	Lectures
Identify risk factors of MSD at workplace	Lectures
Describe prevention of exposure to risk factors related to workplace	Lectures
Describe MSD related to mobile addition with its burden/epidemiology	Lectures
Identify risk factors relates to MSD due to excessive mobile usage.	Lectures
Describe the preventive strategies for mobile addiction related MSD.	Lectures
Describe application of ergonomics in MSD related to above disorders.	Lectures
Describe the concept of non-communicable diseases	Lectures
Identify the risk factors in the community for Osteoporosis	Lectures
Learn and apply interventions to prevent the risk factors for various musculoskeletal diseases in community.	Lectures

Identify and deal with the various psychosocial aspects of Musculoskeletal conditions (such as Osteoarthritis, Osteomyelitis, Rheumatoid arthritis, Gout, chronic back pain, psycho-somatic complaints) and Neuromuscular conditions (Muscular dystrophy, Myasthenia Gravis, Sclerosis) on Individual, Family and Society.	Lectures
Identify the psychosocial risk factors as mediating factors between illness and its effect.	Lectures
Discuss the role of psychological variables like coping, social support, and other health cognitions in mediating between illness and its effect.	Lectures

**ASSESSMENT**  
**INTERNAL ASSESSMENT**  
**BLOCK - 2**  
**(Total 70 Marks)**

THEORY		
S. No	Scoring Parameter	Marks out of 35
1.	Attendance >91% = 2 Marks 85-90% = 1 Mark	02 Marks
2.	Block Exam 71-onwards = 7 Marks 66-70 = 7 Marks 61-65 = 7 Marks 55-60 = 6 Marks	27 Marks
3.	Portfolio, Professional Behavior, Leadership Trait	03 Marks
4.	Continuous Assessment (Formative) – 3 Modules (only Pass)	03 Marks

PRACTICAL AND BEHAVIORAL ASSESSMENT		
S. No	Scoring Parameter	Marks out of 35
1.	Attendance >91% = 2 Marks 85-90% = 1 Mark	02 Marks
2.	Summative Assessment (Block Exam) OSPE / Practical 71-onwards = 7 Marks 66-70 = 7 Marks 61-65 = 6 Marks 55-60 = 6 Marks	26 Marks
3.	Practical books / Clinical Logbooks	07 Marks

## **MARKS DISTRIBUTION**

### **MBBS 1<sup>ST</sup> PROFESSIONAL** **BLOCK - 2**

Theme	Subject	Written Exam			Oral/Practical/Clinical Exam			
		MCQ (1 mark)	SEQ (5 mark each)	Marks	OSPE/OSCE/Viva Stations			Marks
					OSPE (08 marks each)	OSCE (08 marks each)	OSVE (14 marks each observed)	
Normal Structure	Anatomy & applied/clinical	35	04	55	05	-	01	54
Normal Function	Physiology & applied/clinical	17	02	27	02	-	01	30
	Biochemistry & applied/clinical	13	02	23	02	-	0 1	30
Disease Burden & Prevention	Community Medicine & Public Health	06	-	06	-	-	-	-
	Behavioral Sciences	04	-	04	-	-	-	-
Pathophysiology and Pharmacotherapeutics	Pathology	10	01	15	-	-	-	08
	Pharmacology	05	01	10	-	-	-	08
CFRC	CF 1-1	-	-	-	-	01	-	05
PERLs	PERLs 1-1	-	-	-	-	01	-	05
		90	10 x 5 = 50	140	11 Stations x 08 = 88	2 Stations x 05 = 10	3 Stations x 14 = 42	140

## **ASSESSMENT TOOLS**

MCQS

SEQS

OSPE

OSCE

VIVA

## RESOURCE BOOKS

### Anatomy

- Langman's Medical Embryology
- Snell's Clinical Anatomy
- Snell's Clinical Neuroanatomy. Walter Kluwer
- Laiq H.S. Medical Histology. Paramount Books.
- Laiq H.S. General Anatomy. Paramount Books.

### Physiology

- Guyton AC and Hall JE. Textbook of Medical Physiology. W. B. Saunders & Co., Philadelphia.
- Essentials of Medical Physiology by Mushtaq Ahmad

### Biochemistry

- Harper's Biochemistry by Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell. McGraw-Hill latest ed.
- Lippincott's Illustrated Reviews Biochemistry Champe, P.C. & Harvey, E.A latest ed. Published by Lippincott Williams and Wilkins.
- ABC of clinical genetics by H. M. Kingston

### Pathology

- Vinary Kumar, Abul K. Abbas and Nelson Fausto Robbins and Cotran, Pathologic basis of disease. WB Saunders.
- Richard Mitchall, Vinary Kumar, Abul K. Abbas and Nelson Fausto Robbins and Cotran, Pocket Companion to Pathologic basis of diseases. Saunder Harcourt.
- Walter and Israel. General Pathology. Churchill Livingstone.

### Pharmacology

- Basic and Clinical Pharmacology by Katzung, McGraw-Hill.
- Pharmacology by Champe and Harvey, Lippincott Williams & Wilkins

### Behavioral Sciences

- Handbook of Behavioural Sciences by Prof. Mowadat H. Rana, 3rd Edition.
- Medical and Psychosocial Aspects of Chronic Illness and Disability SIXTH EDITION Donna R. Falvo, PhD Beverley E. Holland, PhD, RN,

### Community medicine

- Parks Textbook of Preventive and Social Medicine. K. Park (Editor).
- Public Health and Community Medicine Ilyas, Ansari (Editors)

### Surgery

- Bailey & Love' Short practice of Surgery

### Medicine

- Davidson's Principles and Practice of Medicine

### Islamiyat

- Standard Islamiyat (compulsory) for B.A, BSc, MA, MSc, MBBS by Prof. M. Sharif Islahi.
- Ilmi Islamiyat (compulsory) for BA, BSc, & equivalent.