

## Locomotion Objectives Year 2 Semester 2 – 2011/12 Batch

Concept	Objective	Time	T/L activity	Department
<b>General consideration</b>				
Introduction to limbs and limb girdles	<ol style="list-style-type: none"> <li>1. Describe the evolutionary changes that has taken place when quadruped became a biped</li> <li>2. Describe how the general plan of the upper limb is built for prehension and lower limbs is built for support and propulsion</li> </ol>	1hr	Lecture	Anatomy
Typical spinal nerve	<ol style="list-style-type: none"> <li>1. Recall the segmental supply of the body wall</li> <li>2. Describe the arrangement of a typical spinal nerve</li> <li>3. Describe the segmental innervations of skin and muscles</li> <li>4. Recall neurovascular plane</li> <li>5. Describe limb plexus formation</li> </ol>	1hr	Lecture  PD	Anatomy
Classification of joints and joint movements	1. describe the classification, structure, innervations, vasculature and stability of joints	1hr	Lecture  PD	Anatomy
<b>Tissues of the musculoskeletal system:</b>				
Axial skeleton and movements of the limbs	<ol style="list-style-type: none"> <li>1. describe the main divisions of the human skeleton</li> <li>1. Describe the structure and function of the Bones and Joints of the Spine</li> <li>2. Describe the muscles that move the spine and axial skeleton</li> <li>3. Describe how the movements of lower limbs are intimately related to the axial Skelton</li> <li>4. Describe how the movements of upper/l1 limbs are related to the axial Skelton</li> </ol>	1hr  PD-	Lecture	Anatomy

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<p>Structure of bone and cartilage 2011-2/SBM-9/02</p>	<ol style="list-style-type: none"> <li>1. Classify bones and cartilages</li> <li>2. Describe the parts of a long bone</li> <li>3. Describe the microscopic structure of bone and cartilage composition of bone and cartilage adaptation to function their function.</li> <li>4. State the structural and functional differences between the different types of cartilage</li> </ol>	<p>2hr</p>	<p>Lecture</p>	<p>Anatomy</p>
<p>Collagen and ground substance 2011-2/SBM-9/02</p>	<ol style="list-style-type: none"> <li>1. State the basic steps involved in collagen synthesis and their defects.</li> <li>2. State different types of collagen and their distribution.</li> <li>3. State how the structures of collagen and ground substance of bone facilitate the deposition of bone mineral.</li> </ol> <p>Explain the mechanism of calcification.</p>	<p>1hr</p>	<p>Lecture</p>	<p>Biochemistry</p>
<p>Structure of muscle , tendon, ligament, synovium 2 2011-2/SBM-9/02</p>	<ol style="list-style-type: none"> <li>1. Describe the microscopic structure of the skeletal muscle</li> <li>2. Describe the main ultra structural components of a skeletal muscle cell with special reference to sarcoplasmic reticulum, t tubules, terminal cisternae and actin and myosin filaments</li> <li>6. Describe the different form of skeletal muscles in relation shape and fibre architecture (macroscopic)</li> <li>7. Describe how different forms of muscle influence force and range of contraction</li> <li>5. Describe the microscopic structure of tendon, ligament and synovium and its functional relevance</li> <li>6. Describe the different macroscopic types</li> </ol>	<p>2hr</p>	<p>Lecture</p>	<p>Anatomy</p>

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	of tendons and arrangement of raphes 8. Describe the arrangement of synovial sheaths, membranes and bursae			
Structure of tissues of musculoskeletal system 2011-2/SBM-9/02		2hr	PD	Anatomy
Contraction and relaxation of muscle I 2011-2/SBM-9/03	1. Describe the process of excitation and contraction coupling and muscle relaxation	2hr	Lectures	Physiology
	2. In a muscle tracing, identify the following phenomena, muscle twitch, summation, tetanus, staircase phenomenon, muscle fatigue, effect of temperature on muscle contraction	2hr	PD	Physiology
Form mechanics and coordinated activity of Muscle	1. describe the form and mechanics of muscle form (fiber disposition ,pennation,and mechanics of contraction) 2. describe how coordinated activity of muscles produce movement (prime movers, antagonists, synergist and fixators) 3. explain how gravity assist movement of joints and how muscled contract paradoxically	1hr	Lecture	Anatomy
Muscle metabolism 2011-2/SBM-9/03	1. Recall the three major types of muscle and the distribution of cellular organelles in each and their function.  2. State the major fuels used by skeletal muscle and describe the environment present to promote energy production.  3. Describe the status of ATP/ADP ratio in a skeletal muscle fibre when it is resting and active, explaining how the ratio affects energy production under aerobic and anaerobic (hypoxic) conditions.	2hr	Lecture	Biochemis

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Effect of exercise on muscles				
<p>1. Biochemical Effect of exercise on muscle 2011-2/SBM-9/03</p>	<p>Explain the principles of:</p> <ol style="list-style-type: none"> <li>1. Oxygen debt,</li> <li>2. Changes in the muscle following muscle fatigue after exercise and lactic acidosis</li> <li>3. Recovery from exercise</li> <li>4. Energy cost of exercise in terms of BMR</li> <li>5. Receptor changes in exercise (LDL, insulin etc)</li> <li>6. Changes in blood lipids with exercise</li> <li>7. Calculation of energy requirement for exercise</li> </ol>	<p>2hr</p>	<p>Lecture</p>	<p>Biochemistry</p>
<p>2. Changes in muscle mass to meet the functional demand 2011-2/SBM-9/03</p>	<ol style="list-style-type: none"> <li>1. Describe morphological (ultra-structural) biochemical and physiological adaptations of skeletal muscle that occur in response to exercise</li> <li>2. Describe the characteristics of different muscle fiber types</li> <li>3. Describe how these are adapted for activities requiring rapid, powerful movements or endurance events</li> <li>4. Describe the acute and chronic adaptations of muscles for exercise and training</li> <li>5. Explain how body's diverse energy systems interact to transfer energy during rest and different exercise intensities</li> <li>6. Describe the role of central and peripheral factors in development of fatigue in skeletal muscle fibers.</li> </ol>	<p>3hr</p>	<p>PD</p>	<p style="text-align: center;"><i>J.A. Edman</i></p> <hr style="width: 20%; margin: auto;"/> <p>Chairperson Curriculum Coordinating Committee Faculty of Medicine, University of Peradeniya</p>
	<ol style="list-style-type: none"> <li>1. Describe morphological (ultra-structural) biochemical and physiological adaptations of skeletal muscle that occur in response to exercise</li> <li>2. Describe the characteristics of different muscle fiber types</li> <li>3. Describe how these are adapted for activities requiring rapid, powerful movements or endurance events</li> <li>4. Describe the acute and chronic adaptations of muscles for exercise and training</li> <li>5. Explain how body's diverse energy systems interact to transfer energy during rest and different exercise intensities</li> <li>6. Describe the role of central and peripheral factors in development of fatigue in skeletal muscle fibers.</li> </ol>	<p>2hr</p>	<p>Lecture</p>	<p>Physiology</p>

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Muscle disorders /dysfunctions				
Physiological Basis of muscle disorders/dysfunctions 2011-2/SBM-9/03	1.State the different types of muscle disorders /dysfunction 2.Describe the physiological basis of muscle dysfunction in different muscle disorders	2hr	Lecture	Physiology
Identification of muscle damage 2011-2/SBM-9/03	1.Name the enzymes that are useful in identifying skeletal muscle damage 2.State the alteration in activity of the enzymes in serum following skeletal muscle damage 3.Explain how skeletal muscle damage could be differentiated from cardiac muscle damage based on serum parameter changes 4.Define the term ‘myoglobinuria’ State the effect of myoglobin on nephrons 5.Outline the basis of the determination of enzymes used in the identification of muscle damage ( creatine kinase, LDH, aminotransferases) 6.Describe how myoglobinuria is detected in urine	2hr?  3hr	Lecture  PD	  Chairperson Curriculum Coordinating Committee Faculty of Medicine, University of Peradeniya
Growth and Development				
<b>Development of limb bud</b>	1.Describe the development of the limb bud 2.Describe the development of the musculature, skeleton and nerve supply of the limbs(dermatomes/myotomes) 3.Describe the events that occur during the development of limb buds 4.describe common congenital defects of limbs	2hr	Lectures	Anatomy

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<p>Introduction to Bone growth and remodeling 2011-2/SBM-9/02</p>	<ol style="list-style-type: none"> <li>1.</li> <li>2. Explain what is meant by bone remodeling and the advantage of this process to the body.</li> <li>3. State the role of nutritional and other factors in bone remodeling</li> </ol>	1hr	Lecture	Biochemistry
<p>Vitamins and minerals in relation to bone growth and remodeling 2011-2/SBM-9/02</p>	<ol style="list-style-type: none"> <li>1. Describe the synthesis, functions, dietary sources and recommended daily allowance of vitamin D.</li> <li>2. State the effects of vitamin D deficiency and excess.</li> <li>3. Recall the role of bone, kidney and the intestine in maintaining the calcium and phosphorus concentrations in the blood.</li> <li>4. State the functions of calcium and phosphorus in the body.</li> <li>5. Recall the sources that are rich in calcium in the Sri Lankan diet.</li> <li>6. Describe the role of fluoride in bone mineralisation</li> </ol>	2hr	Lecture	<p style="text-align: center;">   <hr style="width: 100px; margin: auto;"/>                 Chairperson                  Curriculum Coordinating Committee                  Faculty of Medicine,                  University of Peradeniya             </p>
	<p>Ca<sup>++</sup> metabolism, role of nutrients in bone formation (vitamins A, D, K, C, fluoride etc)</p>	2hr	SGD	Biochemistry
<p>Hormones involved in bone/Ca metabolism</p>	<p>Explain the Role of hormones on calcium metabolism</p>	1hr		<b>physiology</b>

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2011-2/SBM-9/02	State the effects of other hormones such as insulin, oestrogen, cortisol, thyroid hormones, growth hormone on bone	1hr		<b>biochemistry</b>
Markers of bone growth 2011-2/SBM-9/02	<ol style="list-style-type: none"> <li>1. Estimation of serum parameters used as markers of bone growth.</li> <li>2. Alkaline phosphatase (isoform)- state types of alkaline phosphatase, differences between them and their tissue distribution</li> <li>3. Hydroxyproline excretion,- significance of elevation</li> <li>4. Serum Ca<sup>2+</sup> &amp; phosphate 24 hr urinary Ca<sup>2+</sup> &amp; phosphate</li> </ol> Alkaline phosphatase.	1hr	Lecture	Biochemistry
		3hr	PD	
Disorders of bone 2011-2/SBM-9/02	<ol style="list-style-type: none"> <li>1. List and explain the factors that contribute to the development of rickets, osteomalacia, osteoporosis, osteoflorosis</li> <li>2. Explain the serum biochemical changes observed in rickets</li> <li>3. Explain the biochemical basis for the clinical signs observed in rickets</li> <li>4. Metabolic bone disorders</li> </ol>	2hr	<b>SGD</b>	Biochemistry
		5hr	<b>CCR</b>	Anatomy
<b>Structure of the upper limb</b>				
<b>Osteology and Surface anatomy</b>	<ol style="list-style-type: none"> <li>1. Identify the bones that form the pectoral girdle and the upper limb</li> <li>2. Name their parts and general features</li> <li>3. Describe how the basic organization of the upper limb skeleton correlates to it s</li> </ol>	2hr	PD	Anatomy

Anatomy

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	<p>function</p> <ol style="list-style-type: none"> <li>4. Demonstrate the bony anatomical landmarks of the pectoral girdle and the upper limb</li> <li>5. Describe the surface projection of structures of the UL</li> <li>6. Describe the dermatomes of the upper limb</li> </ol>			
<p><b>(i) Superficial veins and cutaneous innervation</b>  <b>(ii) Scapular region</b>  <b>(iii) Axilla and brachial plexus</b>  <b>(iv) Arm and cubital fossa</b>  <b>(v) Flexor region of forearm</b>  <b>(vi) Palm of the hand</b>  <b>(vii) Extensor (region of forearm and dorsum of hand)</b></p>	<ol style="list-style-type: none"> <li>1. Describe the arrangement of superficial veins and cutaneous innervations of upper limb</li> <li>2. Describe the regional arrangement of structures of the upper limb</li> <li>3. Describe the attachments innervations, action and surface projections of muscles of upper limb</li> <li>4. Describe the course and relations of nerves and blood vessels of the upper limb</li> <li>5. Describe the arterial supply, venous drainage and nerve supply of upper limb</li> </ol>	<p>(26hr ) 22</p> <p>4hr</p>	<p>PD</p> <p>Revision</p>	<p>Anatomy</p> <p style="text-align: center;"></p> <p style="text-align: center;">Chairperson Curriculum Coordinating Committee Faculty of Medicine, University of Peradeniya</p>
<p>Joints and movements of the upper limb</p>	<ol style="list-style-type: none"> <li>1. Describe the structure movements and stabilizing factors of the shoulder joint, elbow joint and wrist joint</li> <li>2. Describe the movements of the small joints of the hand.</li> <li>3. State the spinal segments for joint movements.</li> </ol>	<p>2hr</p>	<p>PD</p>	<p>Anatomy</p>
<p>Overview of upper limb 2011-2/SBM-9/05</p>	<ol style="list-style-type: none"> <li>1. Describe the structural arrangement of upper limb in relation to its functions</li> <li>2. Describe the interrelationship of the components</li> </ol>	<p>2hr</p> <p>2hr</p>	<p>Lectures</p> <p>SGD</p>	

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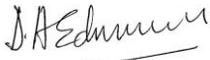
	of the UL in producing movements			
<b>Structure of Lower limb</b>				
<b>Osteology and Surface anatomy</b>	<ol style="list-style-type: none"> <li>1. Identify the bones that form the pelvic girdle and the upper limb</li> <li>2. Name their parts and general features</li> <li>3. Describe how the basic organization of the lower limb skeleton correlates to its function</li> <li>4. Demonstrate the bony anatomical landmarks of the pelvic girdle and the upper limb</li> <li>5. Describe the surface projection of structures of the LL</li> <li>6. Describe the dermatomes of the lower limb</li> </ol>	2hr	PD	Anatomy
<b>Dissections –lower limb</b>				
<ol style="list-style-type: none"> <li>(i) Superficial veins and cutaneous innervation</li> <li>(iii) (ii) Front and medial aspect of the thigh (</li> <li>(iv) Gluteal region</li> <li>(v) Back of the thigh and popliteal fossa</li> <li>(vi) Leg and dorsum of the foot</li> <li>(vii) sole of the foot - including arches of the foot</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe the arrangement of superficial veins and cutaneous innervations of lower limb</li> <li>2. Describe the regional arrangement of structures of the lower limb</li> <li>3. Describe the attachments innervations, action and surface projections of muscles of lower limb</li> <li>4. Describe the course and relations of nerves and blood vessels of the lower limb</li> <li>5. Describe the arterial supply, venous drainage and nerve supply of lower limb</li> </ol>	(24hr ) 20  4hr	Dissections PD  revision	Anatomy
Overview of the lower limb	Describe the structural arrangement of lower limb in	2hr	Lecture	Anatomy

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2011-2/SBM-9/06	relation to its functions Describe the interrelationship of the components of the LL in producing movements Compare and contrast the upper and lower limbs in relation to structure and function			
	5.			
Joints and movements of the lower limb	<ol style="list-style-type: none"> <li>1. Describe the structure movements and stabilizing factors of the hipjoint, knee joint and ankle joint</li> <li>2. Describe the movements of the foot joints .</li> <li>3. State the spinal segments for joint movements.</li> </ol>	2hr	PD	Anatomy
Gait and posture 2011-2/SBM-9/06	<ol style="list-style-type: none"> <li>1. Describe the weight bearing function of the lower limb including foot arches and weight distribution in the foot</li> <li>2. Walking cycle and adaptations of the lower limb to walking, running and landing</li> <li>3. Posture</li> </ol>	1hr	Lecture	Anatomy
Radiology of the upper and lower limbs	<ol style="list-style-type: none"> <li>1. Describe the radiological appearance of different parts of the upper and lower limb</li> <li>2. Be able to detect common defects that can be seen on radiographs of the limbs</li> </ol>	2hrs	Lecture	P.
<b>Clinical correlations</b>				
1.Venous drainage and Lymphatic drainage 2011-2/CLM-9/01	<ol style="list-style-type: none"> <li>1. recall the venous drainage of UL/LL</li> <li>2.describe clinical correlations of venous drainage and of the upper and lower limbs</li> <li>3recall the lymphatic drainage of the UL/LL</li> <li>4.Describe the clinical correlations of lymphatic drainage of UL/LL</li> </ol>	1hr	Lecture	Anatomy

  
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2.Arterial supply of Limbs 2011-2/CLM-9/01	1.recall the arterial supply of UL/LL 2.Describe the clinical significance collateral supply (arterial) of the upper limb 3. Describe the clinical significance collateral supply (arterial) of the lower limb	1hr	Lecture	Anatomy
3. Tissue injuries of limbs	state the common injuries caused by direct and indirect trauma (fracture,dislocation,sprains,strains ect. of UL/LL) 2. state the anatomical basis of such injuries 2. state the structures that can be damage due to intimate relationship and their consequences 3.describe the basis of common non traumatic injuries/pathologies 4. Describe how tissue injury can cause compartment syndromes and their consequences			Anatomy
Nerve injuries of limbs 2011-2/CLM-9/01	1.describe the anatomical basis nerve injuries of upper and lower limbs	2hr	Lecture	Anatomy
Revision Limbs structure		7hr	Mock spot SGD SGL	Anatomy

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### Objectives

1. Students should be able describe the structure (gross/micro/cellular/molecular) function growth and development of tissues of musculoskeletal system in order to describe
  - how structure adapted to perform function and compensate functional demands
  - basis of disorders due to derangement of structure, functions, growth or development, and basis of diagnosis and management
  - basis of diagnosis and management
2. Students should be able describe the normal Structure, functions, growth and development of upper and lower limbs in order to describe
  - How structure adapted to perform function
  - basis of disorders due to derangement of structure, function, growth or development, and basis of diagnosis and management



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