

Scheme of work

For each VTCT (ITEC) qualification, the lecturer/centre must complete a scheme of work for each unit indicating how the Lecturer is planning to cover the unit content throughout the course. Set out the planned sessions in terms of learning outcomes to be achieved. These should match those stated within the VTCT (ITEC) unit specification. Include all units of each course offered. Hours should meet the minimum guided learning hours listed within the unit specification.

Unit title: iUSP159 - Anatomy and physiology for exercise

Total contact tuition hours proposed: 41

Lecturer(s) responsible:

Learning objectives	Lecture content	Suggested resources	Approx. hours
Introductory session	<ul style="list-style-type: none"> College rules and regulations College mission statement VTCT (ITEC) rules and regulations Health & safety Timetable Dates – holidays etc. Syllabus Recommended books 	<ul style="list-style-type: none"> Lecture Q&A Using all the documents listed to ensure the students understand the college expectations and their commitment to the course 	
1. Understand the structure and function of the circulatory system			
Identify the location of the heart	<ul style="list-style-type: none"> Position in the body 	<ul style="list-style-type: none"> Whiteboard Lecture Q&A Handout Homework Test 	5
Describe the function of the heart	<ul style="list-style-type: none"> To act as a pump To receive and propel blood 		
Describe the structure of the heart	<ul style="list-style-type: none"> Layers <ul style="list-style-type: none"> - Pericardium - Myocardium - Endocardium Chambers <ul style="list-style-type: none"> - Right atrium - Right ventricle - Left atrium 		

	<ul style="list-style-type: none"> - Left ventricle - Septum 		
Describe how blood moves through the four chambers of the heart	<ul style="list-style-type: none"> • Chambers <ul style="list-style-type: none"> - Right atrium - Right ventricle - Left atrium - Left ventricle • Deoxygenated blood <ul style="list-style-type: none"> - Superior vena cava vein - Inferior vena cava vein - Pulmonary artery • Oxygenated blood <ul style="list-style-type: none"> - Pulmonary vein - Aorta • Valves <ul style="list-style-type: none"> - Atrio-ventricular (tricuspid and mitral/bicuspid) - Semilunar (aortic and pulmonary) • Control of heart beat <ul style="list-style-type: none"> - Sino-atrial node - Atrio-ventricular node - Bundle of His • Constituents of blood 		
Describe systemic and pulmonary circulation	<ul style="list-style-type: none"> • Systemic circulation to include: <ul style="list-style-type: none"> - Aorta - Superior and inferior vena cava - Arteries, veins and capillaries - Sequence of events <ul style="list-style-type: none"> ▪ Atrial systole ▪ Ventricular systole ▪ Ventricular diastole - Cardiac output <ul style="list-style-type: none"> ▪ Heart rate ▪ Stroke volume (preload, contractility, afterload) • Pulmonary circulation to include: <ul style="list-style-type: none"> - Deoxygenated blood - Pulmonary veins - Pulmonary arteries - Exchange of gases - Oxygenated blood 		
Describe the structure and functions of blood vessels	<ul style="list-style-type: none"> • The structure of the vascular system and how they link to the heart, lungs and muscles to include: 		

	<ul style="list-style-type: none"> - Arteries - Capillaries - Veins • The functions of the vascular system to include: <ul style="list-style-type: none"> - Distribution (respiratory gases, waste products, hormones) - Regulation (body temperature, pH, fluid volume) - Protection (clotting, immune response) • Lymphatic capillaries • Lymphatic vessels • Lymphatic ducts (thoracic duct and right lymphatic duct) • Lymphatic flow • The short and long term effect of exercise on the immune system to include: <ul style="list-style-type: none"> - Moderate exercise - Exhaustive exercise 		
Define blood pressure	<ul style="list-style-type: none"> • Factors which produce, maintain and affect blood pressure 		
Identify blood pressure classifications	<ul style="list-style-type: none"> • Diastolic • Systolic • Hypotension • Hypertension • Normal blood pressure 		

2. Understand the structure and function of the respiratory system			
Identify the location of the lungs	<ul style="list-style-type: none"> • Position in the body 	<ul style="list-style-type: none"> • Whiteboard • Lecture • Q&A • Handout • Homework • Test 	5
Define the function of the lungs	<ul style="list-style-type: none"> • Gaseous exchange 		
Describe the structure of the lungs	<ul style="list-style-type: none"> • Lobes • Bronchioles • Alveoli • Blood vessels • Nerves • Connective tissue • Elastic tissue • Membrane – pleura 		
Identify the main muscles involved in breathing	<ul style="list-style-type: none"> • Inspiration • Expiration • Process of diffusion in the alveoli 		

Describe the passage of air through the Respiratory System	<ul style="list-style-type: none"> • Nose • Nasal cavity • Pharynx • Larynx • Trachea • Bronchi • Bronchioles • Alveoli • Capillaries • Lungs • Pleura (visceral, parietal, pleural cavity) • Diaphragm • Intercostals 		
Describe the process of gaseous exchange of oxygen and carbon dioxide in the lungs	<ul style="list-style-type: none"> • Internal respiration to include: <ul style="list-style-type: none"> - The way in which the exchange of gases takes place between the cells and the circulatory system 		

3. Understand the structure and function of the skeleton			
Describe the basic functions of the skeleton	<ul style="list-style-type: none"> • Support framework • Provides attachments for muscles • Forms joints to provide movement • Forms erythrocytes in the bone marrow • Stores calcium • Protection 	<ul style="list-style-type: none"> • Whiteboard • Lecture • Q&A • Handout • Homework • Test 	5
Identify the structures of the axial skeleton	<ul style="list-style-type: none"> • Skull • Face • Thoracic cage • Vertebrae 		
Identify the structures of the appendicular skeleton	<ul style="list-style-type: none"> • Upper limb <ul style="list-style-type: none"> - Humerus - Ulna - Radius - Carpals - Metacarpals - Phalanges • Lower limb <ul style="list-style-type: none"> - Femur 		

	<ul style="list-style-type: none"> - Tibia - Fibula - Patella - Tarsals - Metatarsals - Phalanges • Shoulder girdle <ul style="list-style-type: none"> - Scapula - Clavicle • Pelvic girdle <ul style="list-style-type: none"> - Innominate bones <ul style="list-style-type: none"> ▪ Ischium ▪ Ilium ▪ Pubis - Pubis symphysis 		
Explain the classifications of bones	<ul style="list-style-type: none"> • Long • Short • Flat • Irregular • Sesamoid • Position in the body 		
Explain the structure of a long bone	<ul style="list-style-type: none"> • Compact bone • Spongy/cancellous bone • Diaphysis • Epiphysis • Epiphyseal plate • Periosteum • Medullary cavity • Cartilage 		
Explain the stages of bone growth	<ul style="list-style-type: none"> • Ossification process pre-natal through childhood to adulthood • The role of osteoblasts and osteoclasts • Growth hormone • Key nutrients in bone growth • Calcium regulation • Bone remodelling 		
Describe posture in terms of: <ul style="list-style-type: none"> • Curves of the spine 	<ul style="list-style-type: none"> • Neutral alignment • Centre of gravity and line of gravity • Base of support 		

<ul style="list-style-type: none"> • Neutral spine alignment • Potential ranges of motion of the spine • Postural deviations to include kyphosis, lordosis, scoliosis and the effect of pregnancy 	<ul style="list-style-type: none"> • Movement • Kyphosis • Lordosis • Scoliosis • Effect of pregnancy • Post-natal joint laxity <ul style="list-style-type: none"> - Sacroiliac joint - Pelvic misalignment - Looseness of joints • Different postural conditions to include <ul style="list-style-type: none"> - Dowager's hump - Round shoulders - Winged scapulae - Midriff bulge - Protruding abdomen - Knock knees - Bow legged - Flat back - Sway back - Stress-related weight changes and postural defects • Different factors which may influence posture to include <ul style="list-style-type: none"> - Hereditary - Injury - Illness – mental and physical - Work-related factors – type of job - Standing - Sitting - Lying - Hobby/sport related influences - Emotional - Environmental - Sleeping position - Beds and pillows - Sustained positions - Repetitive movements - Trends - Pregnancy 		
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4. Understand joints in the skeleton			
Describe the classification of joints	<ul style="list-style-type: none"> • Fibrous joints <ul style="list-style-type: none"> - Fixed • Cartilaginous joints <ul style="list-style-type: none"> - Slightly moveable • Synovial joints <ul style="list-style-type: none"> - Freely moveable - Position in the body 	<ul style="list-style-type: none"> • Whiteboard • Lecture • Q&A • Handout • Homework • Test 	5
Describe the structure of synovial joints	<ul style="list-style-type: none"> • Fibrous capsule joint • Articular cartilage • Synovial cavity • Synovial membrane • Synovial fluid 		
Describe the types of synovial joints and their range of motion	<ul style="list-style-type: none"> • Ball and socket • Hinge • Pivot • Gliding • Saddle • Condyloid • Position in the body 		
Describe joint movement potential and joint actions	<ul style="list-style-type: none"> • Attachments <ul style="list-style-type: none"> - Origin - Insertion • Actions <ul style="list-style-type: none"> - Flexion - Extension - Hyper-extension - Abduction - Adduction - Internal rotation - External rotation - Circumduction - Elevation - Depression - Lateral flexion - Horizontal flexion and extension - Supination - Pronation - Dorsiflexion - Plantarflexion 		

	<ul style="list-style-type: none"> - Inversion - Eversion 		
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5. Understand the muscular system			
Identify the three types of muscle tissue	<ul style="list-style-type: none"> • Cardiac muscle • Smooth muscle • Skeletal muscle 	<ul style="list-style-type: none"> • Whiteboard • Lecture • Q&A • Handout • Homework • Test 	6
Define the characteristics and functions of the three types of muscle tissue	<ul style="list-style-type: none"> • Cardiac muscle <ul style="list-style-type: none"> - Striated - Involuntary • Smooth muscle <ul style="list-style-type: none"> - Non-striated - Involuntary • Skeletal muscle <ul style="list-style-type: none"> - Striated - Voluntary 		
Describe the basic structure of skeletal muscle	<ul style="list-style-type: none"> • Fascicle • Fibre • Myofibril (sarcomere segments) • Epimysium • Perimysium • Endomysium 		
Name and locate the anterior skeletal muscles	<ul style="list-style-type: none"> • Position • Action • Muscles <ul style="list-style-type: none"> - Anterior deltoid - Pectoralis major and minor - Biceps - Rectus abdominus - Obliques: external, internal - Transversus abdominus - Hip flexors: iliacus, psoas major (illiopsoas) - Quadriceps: vastus lateralis, vastus intermedialis, vastus medialis, rectus femoris - Tibialis anterior 		
Name and locate the posterior skeletal muscles:	<ul style="list-style-type: none"> • Position • Action • Muscles <ul style="list-style-type: none"> - Trapezius - Posterior deltoid 		

	<ul style="list-style-type: none"> - Triceps - Latissimus dorsi - Erector spinae - Gluteals: gluteus maximus, gluteus medius, gluteus minimus - Hamstrings: semitendinosus, semibranosus, biceps femoris - Gastrocnemius - Soleus 		
Describe the structure and function of the pelvic floor muscles	<ul style="list-style-type: none"> ● Pelvic floor muscles ● Transverse abdominus ● Multifidus 		
Describe the different types of muscle action	<ul style="list-style-type: none"> ● Agonist/prime mover ● Antagonist ● Synergists ● Fixators/stabilisers ● Isometric action and contraction ● Isotonic action and contraction ● Isokinetic ● Concentric action and contraction ● Eccentric action and contraction 		
Identify the joint actions brought about by specific muscle group actions	<ul style="list-style-type: none"> ● Spine <ul style="list-style-type: none"> - Structure - Actions and range of movement <ul style="list-style-type: none"> ▪ Flexion ▪ Extension ▪ Rotation ▪ Side flexion ● Major synovial joints <ul style="list-style-type: none"> - Shoulder - Elbow - Wrist - Hip - Knee - Ankle ● Actions and range of movements of each joint 		
Identify skeletal muscle fibre types and their characteristics	<ul style="list-style-type: none"> ● Slow twitch <ul style="list-style-type: none"> - Type I - Red ● Fast twitch <ul style="list-style-type: none"> - Type 11a - Fast oxidative glycolytic or FOG - Type 11b - Fast glycolytic or (FG) 		

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6. Understand the life-course of the musculoskeletal system and its implications for special populations exercise			
Describe the life-course of the musculoskeletal system, and its implications for working with: <ul style="list-style-type: none"> • Young people in the 14 -16 age range • Antenatal and postnatal women • Older people (50 plus) To include relevant tendon, ligament, muscle, joint and bone mineral density changes and their implications for exercise	<ul style="list-style-type: none"> • Young people (14 -16 age range) • Antenatal and postnatal women • Older adults (50 plus) 	<ul style="list-style-type: none"> • Whiteboard • Lecture • Q&A • Handout • Homework • Test 	5

7. Understand energy systems and their relation to exercise			
Describe how carbohydrates, fats and proteins are used in the production of energy/adenosine triphosphate	<ul style="list-style-type: none"> • Carbohydrates (sugar and starches) • Oxygen • Fats • Proteins 	<ul style="list-style-type: none"> • Whiteboard • Lecture • Q&A • Handout • Homework • Test 	5
Explain the use of the three energy systems during aerobic and anaerobic exercise	<ul style="list-style-type: none"> • Anaerobic creatine phosphate/phosphocreatine <ul style="list-style-type: none"> - Utilises high energy phosphates in muscles (ATP and PC) - Short duration activities (up to approximately 10 seconds maximal effort) - High intensity - Limiting factors • Anaerobic system/lactic acid <ul style="list-style-type: none"> - Breakdown of glycogen without using oxygen - Lactic acid formation - Short duration activities (up to approximately 3 minutes) - High intensity - Limiting factors • Aerobic system <ul style="list-style-type: none"> - Breakdown of glycogen using oxygen - Long duration activities (over approximately 3 minutes) 		

	<ul style="list-style-type: none"> - Low intensity - Limiting factors • Practical examples of when each system is predominantly in use • Relevance of each to individuals in relation to aims and objectives of the training programme 		
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8. Understand the nervous system and its relation to exercise			
Describe the role and functions of the nervous system	<ul style="list-style-type: none"> • Central nervous system <ul style="list-style-type: none"> - Brain - Spinal cord • Peripheral nervous system <ul style="list-style-type: none"> - 31 pairs of spinal nerves - 12 pairs of cranial nerves • Autonomic nervous system <ul style="list-style-type: none"> - Sympathetic - Parasympathetic 	<ul style="list-style-type: none"> • Whiteboard • Lecture • Q&A • Handout • Homework • MCQ examination paper 	5
Describe the principles of muscle contraction	<ul style="list-style-type: none"> • Innervation <ul style="list-style-type: none"> - Initiation of contraction - All-or-none theory • Energy for contraction <ul style="list-style-type: none"> - Fatigue • Sliding filament theory <ul style="list-style-type: none"> - Actin and myosin - Cross bridges • Type of contraction <ul style="list-style-type: none"> - Isotonic – concentric and eccentric - Isometric (static) • Isokinetic 		
Describe the 'all-or-none law'/motor unit recruitment	<ul style="list-style-type: none"> • The motor unit • Axon terminals • Acetylcholine • Sodium ions • The action potential • The sodium/potassium pump • Sliding filament theory – including sarcoplasmic reticulum, calcium ions, ATP • All-or-none law of muscle physiology • Muscle fatigue and oxygen debt 		
Describe how exercise can enhance neuromuscular	<ul style="list-style-type: none"> • To include the stretch reflex: <ul style="list-style-type: none"> - Neural receptors/sense organs 		

connections and improve motor fitness	<ul style="list-style-type: none">- Golgi tendon organs- Proprioceptive neuromuscular facilitation (PNF)		
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Document History

Version	Issue Date	Changes	Role
v1	30/09/2019	First published	Qualification Administrator