



# **04 YEARS CURRICULUM OF PROSTHETIC AND ORTHOTICS PROGRAM**



## SCHEME OF STUDIES FOR 4 YEARS PROTHETIC AND ORTHOTICS (P&O) PROGRAM

### FIRST SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
RSC 601	ANATOMY –I	4 (3-1)
RSC 602	PHYSIOLOGY-I	3(2-1)
RSC 604	ENGLISH-I	3(3-0)
RSC 605	PAKISTAN STUDIES	2(2-0)
RSC 606	INTRODUCTION TO COMPUTER	3(2-1)
PO 601	APPLIED PROTHETICS & ORTHOTICS I	3(3-0)
		18

### SECOND SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
RSC 611	ANATOMY –II	4(3-1)
RSC 614	ENGLISH-II	3(3-0)
RSC 615	ISLAMIC STUDIES / ETHICS	2(2-0)
RSC 612	Physiology-II	3(3-0)
PO611	MECHANICS AND MATHEMATICS	2(2-0)
PO612	APPLIED PROSTHETICS AND ORTHOTICS II	3(1-2)
		17

### THIRD SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
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<b>RSC 622</b>	ANATOMY –III	<b>3(2-1)</b>
<b>RSC 623</b>	<b>PHYSIOLOGY-III</b>	<b>3 (2-1)</b>
<b>RSC 621</b>	ENGLISH-III	<b>3(3-0)</b>
<b>PO 621</b>	APPLIED PROSTHETICS& ORTHOTICS III	<b>3(3-0)</b>
<b>PO 622</b>	MATERIAL SCIENCE	<b>3(2-1)</b>
<b>PO 623</b>	ELECTRO-TECHNOLOGY	<b>3(3-0)</b>
		<b>18</b>

#### FOURTH SEMESTER

<b>COURSE CODE</b>	<b>SUBJECTS</b>	<b>CREDIT HOURS</b>
<b>RSC 631</b>	<b>ANATOMY IV</b>	<b>3(3-0)</b>
<b>RSC 632</b>	<b>BIOMECHANICS &amp; ERGONOMICS II</b>	<b>3(2-1)</b>
<b>RSC 633</b>	<b>BEHAVIORAL SCIENCES (PSYCHIATRY &amp; PSYCHOLOGY)</b>	<b>3(3-0)</b>
<b>PO 631</b>	APPLIED PROSTHETICS AND ORTHOTICS IV	<b>3(1-2)</b>
<b>PO 632</b>	ADVANCED PROSTHETICS	<b>3(2-1)</b>
<b>PO 623</b>	WORKSHOP TECHNOLOGY	<b>3(2-1)</b>
		<b>18</b>

#### FIFTH SEMESTER

<b>COURSE CODE</b>	<b>SUBJECTS</b>	<b>CREDIT HOURS</b>
<b>RSC 641</b>	<b>PATHOLOGY &amp; MICROBIOLOGY I</b>	2(2-0)
<b>RSC 662</b>	<b>SURGERY I</b>	3(3-0)
<b>PO 642</b>	CLINICAL ORTHOPAEDICS	2(1-1)
<b>PO 643</b>	WORKSHOP MANAGEMENT	3(3-0)
<b>PO 645</b>	APPLIED PROSTHETICS & ORTHOTICS V	4(1-3)
<b>PO 646</b>	CLINICAL STUDIES	3(2-1)
		<b>17</b>

**SIXTH SEMESTER**

COURSE CODE	SUBJECTS	CREDIT HOURS
RSC 651	PATHOLOGY & MICROBIOLOGY II	2(2-0)
PO 651	EVIDENCE BASED PRACTICE	3(2-1)
RSC 665	BIOSTATISTICS I	3(3-0)
RSC 663	RADIOLOGY & DIAGNOSTIC IMAGING	3(2-1)
RSC 672	SURGERY II	3(3-0)
PO 652	APPLIED PROSTHETICS & ORTHOTICS VI	4(1+3)
		<b>18</b>

**SEVENTH SEMESTER**

COURSE CODE	SUBJECTS	CREDIT HOURS
PO 661	ORTHOTICS CLINICAL PRACTICE I	3(1-2)
PO 662	PROSTHETICS CLINICAL PRACTICE I	3(1-2)
RSC 674	BIOSTATISTICS II	3(3-0)
PO 663	FOOT CARE (DIABETIC/NEUROPATHIC FOOT)	3(3+0)
PO 664	ADVANCED ORTHOTICS	3(2+1)
RSC 684	SCIENTIFIC INQUIRY & RESEARCH METHODOLOGY	3(2-1)
		<b>18</b>

**EIGHT SEMESTER**

COURSE CODE	SUBJECTS	CREDIT HOURS
PO 671	ORTHOTICS CLINICAL PRACTICE II	4(1+3)
PO 672	PROSTHETICS CLINICAL PRACTICE II	4(1+3)
PO 673	RESEARCH PROJECT	6(6+0)
PO 674	MOTION ANALYSIS	3(3+0)
		<b>17</b>



## FIRST SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
<b>RSC 601</b>	ANATOMY –I	<b>4 (3-1)</b>
<b>RSC 602</b>	PHYSIOLOGY-I	<b>3(2-1)</b>
<b>RSC 604</b>	ENGLISH-I	<b>3(3-0)</b>
<b>RSC 605</b>	PAKISTAN STUDIES	<b>2(2-0)</b>
<b>RSC 606</b>	INTRODUCTION TO COMPUTER	<b>3(2-1)</b>
<b>PO 601</b>	APPLIED PROTHETICS & ORTHOTICS I	<b>3(3-0)</b>
		<b>18</b>



# ANATOMY -I

## COURSE DESCRIPTION

The focus of this course is an in-depth study and analysis of the regional and systemic organization of the body. Emphasis is placed upon structure and function of human movement. A comprehensive study of human anatomy with emphasis on the nervous, musculoskeletal, and circulatory systems is incorporated. Introduction to general anatomy lays the foundation of the course. Dissection and identification of structures in the cadaver supplemented with the study of charts, models, prosected materials and radiographs are utilized to identify anatomical landmarks and configurations of the upper limb and thoracic region.

### ■ GENERAL ANATOMY

- Terms related to position and movements
- The skin and subcutaneous tissues
- Layers of skin
- Integuments of skin
- Glands associated with hair follicle
- Microscopic picture of skin

### ■ BONES AND CARTILAGES

- Osteology
- Functions of Bones z Classification of bones z Parts of developing long bones
- Blood supply of bones
- Lymphatic vessels & nerve supply
- Rule of direction of nutrient foramen
- Gross structure of long bone
- Surface marking
- Cartilage
- Development of bone and cartilage
- Microscopic picture of cartilage and bone



## ■ THE MUSCLE

- Introduction
- Histological Classification
- Functions of muscles in general
- Type of skeletal muscles
- Parts of skeletal muscle and their action
- Nomenclature
  
- Microscopic picture of muscle

## ■ STRUCTURES RELATED TO MUSCLES & BONES

- Tendons
- Aponeurosis
- Fasciae
- Synovial bursae
- Tendon Synovial sheaths
- Raphae
- Ligaments
- Condyle
- Epicondyle
- Ridge
- Tuberosity
- Tubercle
- Foramen
- Canal
- Groove
- Process
- Spur



## ■ THE JOINTS

- Introduction
- Functional classifications
- Structural classification
- Structures comprising a Synovial joint
- Movements of joints
- Blood supply of Synovial joints, their nerve supply and lymphatic drainage
- Factors responsible for joint stability
- Development of joints

## ■ CARDIOVASCULAR SYSTEM

- Definition
- Division of circulatory system into pulmonary & systemic
- Classification of blood vessels and their microscopic picture
- Heart and its histology
- Function of the Heart
- Anastomosis

## ■ NERVOUS SYSTEM

- Definition
- Outline of cellular architecture
- Classification of nervous system
- Parts of the central nervous system
- Microscopic picture of cerebrum, cerebellum, spinal cord
- Functional components of a nerve
- Typical spinal nerve
- Microscopic picture of nerve
- Introduction of autonomic nervous system

- Anatomy of neuromuscular junction

### ■ UPPER LIMB OSTEOLOGY

Detailed description of all bones of upper limb and shoulder girdle along their musculature and ligamentous attachments.

### ■ MYOLOGY

- Muscles connecting upper limb to the axial skeletal
- Muscles around shoulder joint
- Walls and contents of axilla
- Muscles in brachial region
- Muscles of forearm
- Muscles of hand
- Retinacula
- Palmar apouenrosis
- Flexor tendon dorsal digital expansion

### ■ NEUROLOGY

- Course, distribution and functions of all nerves of upper limb.
- Brachial plexus

### ■ ANGIOLOGY (CIRCULATION)

- Course and distribution of all arteries and veins of upper limb.
- Lymphatic drainage of the upper limb
- Axillary lymph node
- Cubital fossa

### ■ ARTHROLOGY

- Acromioclavicular and sternoclavicular joints
- Shoulder joint z Elbow joint

- Wrist joint
- Radioulnar joints
- Inter carpal joints
- Joints MCP and IP
- Surface Anatomy of upper limb
- Surface marking of upper limb

## ■ DEMONSTRATIONS

- Demonstration on Shoulder joint, attached muscles and articulating surfaces.
- Demonstration on Elbow joint.
- Demonstration on Wrist joint
- Demonstration on Radioulnar joint.
- Demonstration on MCP and IP joints.
- Demonstration on acromioclavicular joint
- Demonstration on sternoclavicular joint
- Demonstration on Brachial plexus.
- Demonstration of blood supply of brain.
  - Demonstration on Structure of bones

## ■ THORAX

### ● STRUCTURES OF THE THORACIC WALL

- Dorsal spine (Vertebrae)
- Sternum
- Costal Cartilages & Ribs
- Intercostal Muscles
- Intercostal Nerves
- Diaphragm
- Blood supply of thoracic wall
- Lymphatic drainage of thoracic wall

- Joints of thorax

## ● THORACIC CAVITY

- Mediastinum
- Pleura
- Trachea
- Lungs
- Bronchopulmonary segments
- Pericardium
- Heart – Its blood supply, venous drainage & nerve supply
- Large veins of thorax, superior and inferior vena cava, pulmonary veins brachiocephalic veins.
- Large Arteries – Aorta & its branches

## ■ PRACTICAL

During study of Gross Anatomy, emphasis should be given on applied aspect, radiological anatomy, surface anatomy and cross-sectional anatomy of the region covered in the respective semester /year

## ■ RECOMMENDED TEXT BOOKS

- Gray's Anatomy by Prof. Susan Standring 39th Ed., Elsevier.
- Clinical Anatomy for Medical Students by Richard S.Snell.
- Clinically Oriented Anatomy by Keith Moore.
- Clinical Anatomy by R.J. Last, Latest Ed.
- Cunningham's Manual of Practical Anatomy by G.J. Romanes, 15th Ed., Vol-I, II and III.
- The Developing Human. Clinically Oriented Embryology by Keith L. Moore, 6th Ed.
- Wheater's Functional Histology by Young and Heath, Latest Ed.
- Medical Histology by Prof. Laiq Hussain.
- Neuroanatomy by Richard S.Snell.

## **CARDIOVASCULAR SYSTEM**

### **PHYSIOLOGY -I**

#### **■ COURSE DESCRIPTION**

The course is designed to study the function of the human body at the molecular, cellular, tissue and systems levels. The major underlying themes are: the mechanisms for promoting homeostasis; cellular processes of metabolism, membrane function and cellular signaling; the mechanisms that match supply of nutrients to tissue demands at different activity levels; the mechanisms that match the rate of excretion of waste products to their rate of production; the mechanisms that defend the body against injury and promote healing.

These topics are addressed by a consideration of nervous and endocrine regulation of the cardiovascular, hematopoietic, pulmonary, renal, gastrointestinal, and musculoskeletal systems including the control of cellular metabolism. The integrative nature of physiological responses in normal function and disease is stressed throughout the course. This course will serve as a prerequisite for the further courses i.e. exercise physiology, pathology, etc.

#### **■ BASIC AND CELL PHYSIOLOGY**

- Functional organization of human body
- Homeostasis
- Control systems in the body
- Cell membrane and its functions
- Cell organelles and their functions
- Genes: control and function

#### **■ NERVE AND MUSCLE**

- Structure and function of neuron
- Physiological properties of nerve fibers
- Physiology of action potential
- Conduction of nerve impulse

- Nerve degeneration and regeneration.
- Synapses
- Physiological structure of muscle
- Skeletal muscle contraction
- Skeletal, smooth and cardiac muscle contraction.
- Neuromuscular junction and transmission
- Excitation contraction coupling
- Structure and function of motor unit

### ■ **CLINICAL MODULE**

- Perform nerve conduction studies and explain their clinical importance
- Myopathies and neuropathies
- Peripheral nerve injuries
- Heart and circulation
- Function of cardiac muscle
- Cardiac pacemaker and cardiac muscle contraction
  - Cardiac cycle
  - ECG: recording and interpretation
  - Common arrhythmias and its mechanism of development
  - Types of blood vessels and their function
  - Haemodynamics of blood flow (local control systemic circulation its regulation and control).
- Peripheral resistance its regulation and effect on circulation
- Arterial pulse
- Blood pressure and its regulation
- Cardiac output and its control
- Heart sounds and murmurs Importance in circulation and control of venous return.
- Coronary circulation
- Splanchnic, pulmonary and cerebral circulation
- Triple response and cutaneous circulation

- Foetal circulation and circulatory changes at birth

### ■ CLINICAL MODULE

- Clinical significance of cardiac cycle, correlation of ECG and heart sounds to cardiac cycle
- Clinical significance of cardiac cycle, interpretation of ischemia and arrhythmias
- Effects of hypertension
- Clinical significance of heart sounds
- Effects of ischemia
- Shock

### ■ PHYSIOLOGY PRACTICALS

- Cardiovascular System
- Cardiopulmonary resuscitation (to be coordinated with the department of medicine)
- Examination of arterial pulse
- ECG recording and interpretation
- Arterial blood pressure
- Effects of exercise and posture on blood pressure
- Apex beat and normal heart sounds

### ■ RECOMMENDED BOOKS

- Textbook of Physiology by Guyton and Hall, Latest Ed.
- Review of Medical Physiology by William F. Ganong, Latest Ed.
- Physiology by Berne and Levy, Latest Ed.
- Human Physiology: The Basis of Medicine by Gillian Pocock, Christopher D. Richards
- Physiological Basis of Medical Practice by John B. West and Taylor, 12th Ed.

## English I

### COURSE DESCRIPTION

Enhance language skills and develop critical thinking.



## **COURSE CONTENTS**

- Basics of Grammar
- Parts of speech and use of articles
- Sentence structure, active and passive voice
- Practice in unified sentence
- Analysis of phrase, clause and sentence structure
- Transitive and intransitive verbs
- Punctuation and spelling

## **COMPREHENSION**

Answers to questions on a given text

## **DISCUSSION**

General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)

## **LISTENING**

To be improved by showing documentaries/films carefully selected by subject teachers

## **TRANSLATION SKILLS**

Urdu to English

## **PARAGRAPH WRITING**

Topics to be chosen at the discretion of the teacher

## **PRESENTATION SKILLS**

Introduction

Note: Extensive reading is required for vocabulary building

## **RECOMMENDED BOOKS**

- Functional English
- Grammar
- Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492zPractical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506zWritingzWriting. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary
- Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.zReading/ComprehensionzReading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression
- 1992. ISBN 0 19 453402 2.
- Speaking

## **PAKISTAN STUDIES**

### **COURSE DESCRIPTION**

Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan. Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

### **HISTORICAL PERSPECTIVE**

- Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.
- Factors leading to Muslim separatism PEOPLE AND LAND
- Indus Civilization
- Muslim advent
- Location and geo-physical features

### **GOVERNMENT AND POLITICS IN PAKISTAN**

Political and constitutional phases:

- 1947-58
- 1958-71
- 1971-77
- 1977-88
- 1988-99
- 1999 onward

### **CONTEMPORARY PAKISTAN**

- Economic institutions and issues
- Society and social structure
- Ethnicity
- Foreign policy of Pakistan and challenges
- Futuristic outlook of Pakistan

### **RECOMMENDED BOOKS**

- Burki, Shahid Javed. State & Society in Pakistan, The Macmillan Press Ltd 1980.
- Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: Oxford University Press, 2000.
- S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
- Mehmood, Safdar. Pakistan Political Roots & Development. Lahore, 1994.
- Wilcox, Wayne. The Emergence of Bangladesh, Washington: American Enterprise, Institute of Public Policy

### **INTRODUCTION TO COMPUTER**

## **COURSE DESCRIPTION**

This is an introductory course on Information and Communication Technologies. Topics include ICT terminologies, hardware and software components, the internet and world wide web, and ICT based applications.

## **COURSE CONTENTS**

- Basic Definitions & Concepts
- Hardware: Computer Systems & Components
- Storage Devices , Number Systems
- Software: Operating Systems, Programming and Application Software
- Introduction to Programming, Databases and Information Systems
- Networks
- Data Communication
- The Internet, Browsers and Search Engines
- The Internet: Email, Collaborative Computing and Social Networking
- The Internet: E-Commerce
- IT Security and other issues
- Project Week
- Review Week

## **RECOMMENDED BOOKS**

- Introduction to Computers by Peter Norton, 6th International Edition (McGraw HILL)
- Using Information Technology: A Practical Introduction to Computer & Communications by Williams Sawyer, 6th Edition (McGraw HILL)
- Computers, Communications & information: A user's introduction by Sarah E. Hutchinson, Stacey C. Swayer
- Fundamentals of Information Technology by Alexis Leon, Mathewsleon Leon press

## **APPLIED PROTHETICS & ORTHOTICS I**

### **CONTENT:**

## **INTRODUCTION TO PROSTHETICS AND ORTHOTICS - Theory**

- Physical Rehabilitation
- Prosthetics and orthotics
- Prosthetics and orthotics terminology
  - Prosthetic levels
  - Orthotic device classification

## **ORTHOPAEDIC FOOTWEAR AND SHOE MODIFICATIONS**

- Component parts of the shoe
- Common shoe modifications including:
  - Flares(buttress) and wedges
  - Rocker heels and soles
  - Metatarsal bars
  - Shoe lifts or raises
  - Thomas heel
  - SACH heel
- Orthopaedic footwear
  - Types and indication for their use
  - Measurement and last production
  - Fitting process and shoe production

## **FOOT ORTHOTICS - Theory**

- Revision of internal and surface anatomy of the foot
- Revision of the biomechanics concerning the normal foot
- Common foot deformities and the pathologies that produce them
- Revision of normal and pathological gait
- Material and components parts including:
  - Raises and wedges
  - Metatarsal domes and bars
  - Medial arch support
- Design principals (accommodate/correct/pain relief) and corrective forces
- Simple and stock insoles
- Moulded insoles
  - Soft
  - Rigid
  - Hybrid
  - Supra-malleoli and UCBL
- Fitting, check-out, delivery and follow-up

### **FOOT ORTHOTICS - Demonstration**

- Static and dynamic assessment of the foot
- Formulation of functional loss
- Device design and corrective forces
- Casting and measurements
- Rectification of the positive model
- Foot orthosis (FO) manufacture
- Fitting - static and dynamic alignment
- Check-out, delivery and follow-up

### **FOOT ORTHOTICS – Practical**

- Static and dynamic assessment of the foot
- Formulation of functional loss
- Device design and corrective forces
- Casting and measurements
- Rectification of the positive model
- Foot orthosis (FO) manufacture
- Fitting - static and dynamic alignment
- Check-out, delivery and follow-up

### **RECOMMENDED TEXT BOOKS:**

1. *ICRC Physical Rehabilitation Programme, Lower Limb Orthotics – Foot Orthotics - ICRC*
2. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
3. *Atlas of Amputations and Limb Deficiencies* by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
4. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier

## SECOND SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
<b>RSC 611</b>	ANATOMY –II	<b>4(3-1)</b>
<b>RSC 614</b>	ENGLISH-II	<b>3(3-0)</b>
<b>RSC 615</b>	ISLAMIC STUDIES / ETHICS	<b>2(2-0)</b>
<b>RSC</b>	PHYSIOLOGY II	<b>3(3-0)</b>
<b>PO612</b>	MECHANICS AND MATHEMATICS	<b>2(2-0)</b>
<b>PO613</b>	APPLIED PROSTHETICS AND ORTHOTICS II	<b>3(1-2)</b>
		<b>18</b>



## **Anatomy II**

### **COURSE DESCRIPTION**

The focus of this course is an in-depth study and analysis of the regional and systemic organization of the body. Emphasis is placed upon structure and function of human movement. A comprehensive study of human anatomy with emphasis on the nervous, musculoskeletal and circulatory systems is incorporated. Introduction to general anatomy lays the foundation of the course. Dissection and identification of structures in the cadaver supplemented with the study of charts, models, prosected materials and radiographs are utilized to identify anatomical landmarks and configurations of the lower limb and abdomen pelvis.

### **LOWER LIMB**

#### **OSTEOLOGY**

Detailed description of all bones of lower limb and pelvis along their musculature and ligamentous attachments.

#### **MYOLOGY**

- Muscles of gluteal region
- Muscles around hip joint
- Muscles of thigh (anteriorly, posteriorly, laterally and medially)
- Muscles of lower leg and foot.

#### **NEUROLOGY**

- Course, distribution, supply of all nerves of lower limb and gluteal region
- Lumbosacral plexus.

#### **ANGIOLOGY**

Course and distribution of all arteries, veins and lymphatic drainage of lower limb

#### **ARTHROLOGY**

- Pelvis
- Hip joint
- Knee joint
- Ankle joint
- Joints of the foot
- Surface Anatomy of lower limb



- Surface marking of lower limb

## **ABDOMEN**

- ABDOMINAL WALL
- Structures of anterior abdominal wall: superficial and deep muscles
- Structure of rectus sheath
- Structures of Posterior abdominal wall
- Lumbar spine (vertebrae)
- Brief description of viscera

## **PELVIS**

- Brief description of anterior, posterior and lateral walls of the pelvis
- Inferior pelvic wall or pelvic floor muscles
- Sacrum
- Brief description of perineum
- Nerves of perineum

## **GENERAL HISTOLOGY**

- Cell
- Epithelium
- Connective tissue
- Bone
- Muscles tissue
- Nervous tissues
- Blood vessels
- Skin and appendages
- Lymphatic organs

## **PRACTICAL**

During study of Gross Anatomy, emphasis should be given on applied aspect, radiological anatomy, surface anatomy and cross-sectional anatomy of the region covered in the respective semester /year

## **RECOMMENDED BOOKS**

- Gray's Anatomy by Prof. Susan Standring 39th Ed., Elsevier.
- Clinical Anatomy for Medical Students by Richard S.Snell.
- Clinically Oriented Anatomy by Keith Moore.
- Clinical Anatomy by R.J. Last, Latest Ed.

- Cunningham's Manual of Practical Anatomy by G.J. Romanes, 15th Ed., Vol-I, II and III.
- The Developing Human. Clinically Oriented Embryology by Keith L. Moore, 6th Ed.
- Wheater's Functional Histology by Young and Heath, Latest Ed.
- Medical Histology by Prof. Laiq Hussain.
- Neuroanatomy by Richard S. Snell.

## **PHYSIOLOGY -II**

### **COURSE DESCRIPTION**

The course is designed to study the function of the human body at the molecular, cellular, tissue and systems levels. The major underlying themes are: the mechanisms for promoting homeostasis; cellular processes of metabolism, membrane function and cellular signaling; the mechanisms that match supply of nutrients to tissue demands at different activity levels; the mechanisms that match the rate of excretion of waste products to their rate of production; the mechanisms that defend the body against injury and promote healing. These topics are addressed by a consideration of nervous and endocrine regulation of the cardiovascular, hematopoietic, pulmonary, renal, gastrointestinal, and musculoskeletal systems including the control of cellular metabolism. The integrative nature of physiological responses in normal function and disease is stressed throughout the course. This course will serve as pre requisite for the further courses i.e. exercise physiology, pathology, etc.

### **RESPIRATORY SYSTEM**

- Function of respiratory tract
- Respiratory and non-respiratory function of the lungs
- Mechanics of breathing
- Production & function of surfactant and compliance of lungs
- Protective reflexes
- Lung volumes and capacities including dead space
- Diffusion of gases across the alveolar membrane
- Relationship between ventilation and perfusion
- Mechanism of transport of oxygen and carbon dioxide in blood.
- Nervous and chemical regulation of respiration
- Abnormal breathing,
- Hypoxia, its causes and effects
- Cyanosis, its causes and effects

### **CLINICAL MODULE**

- Clinical importance of lung function tests
- Causes of abnormal ventilation and perfusion

- Effects on pneumothorax, pleural effusion, and pneumonia
- Respiratory failure
- Artificial respiration and uses & effects of O<sub>2</sub> therapy
- Clinical significance of hypoxia, cyanosis, and dyspnoea

## **GASTROINTESTINAL TRACT**

- General functions of gastrointestinal tract
- Enteric nervous system
- Control of gastrointestinal motility and secretion
- Mastication
- Swallowing: mechanism and control
- Functions, motility and secretions of stomach
- Functions, motility and secretions of small intestine
- Functions, motility and secretions of large intestine
- Functions of GIT hormones
- Mechanism of vomiting and its control pathway
- Defecation and its control pathway
- Functions of liver
- Functions of gallbladder and bile in digestion
- Endocrine & exocrine pancreas and functions of pancreas in digestion

## **CLINICAL MODULE**

- Dysphagia
- Physiological basis of acid peptic disease
- Causes of vomiting
- Diarrhea and constipation in clinical settings
- Jaundice and liver function tests in clinical settings BLOOD
- Composition and general functions of blood
- Plasma proteins their production and function
- Erythropoiesis and red blood cell function
- Structure, function, production and different types of haemoglobin
- Iron absorption storage and metabolismzBlood indices, Function, production and type of white blood cells
- Function and production of platelets
- Clotting mechanism of blood
- Blood groups and their role in blood transfusion
- Complications of blood transfusion with reference to ABO & RH incompatibility

- Components of reticuloendothelial systems, gross and microscopic structure including tonsil, lymph node and spleen
- Development and function of reticuloendothelial system

### **CLINICAL MODULE**

- Anemia and its different types
- Blood indices in various disorders
- Clotting disorders
- Blood grouping and cross matching
- Immunity

### **ENDOCRINOLOGY**

- Classification of endocrine glands
- Mechanism of action
- Feedback and control of hormonal secretion
- Functions of the hypothalamus
- Hormones secreted by the anterior and posterior pituitary and their mechanism of action and function
- Function of the thyroid gland
- Function of the parathyroid gland
- Calcium metabolism and its regulation
- Secretion and function of calcitonin
- Hormones secreted by the adrenal cortex and medulla, and their function and mechanism of action
- Endocrine functions of the pancreas, Control of blood sugar. Hormones secreted by the gastrointestinal system and their function
- Function of the thymus
- The endocrine functions of the kidney and Physiology of growth

### **CLINICAL MODULE**

- Acromegaly, gigantism and dwarfism.
- Effects of panhypopituitarism.
- Diabetes insipidus.
- Thyrotoxicosis and myxoedema.
- Pheochromocytoma.
- Cushing's disease.
- Adrenogenital syndrome.
- Diabetes mellitus and hypoglycaemia.

## **PHYSIOLOGY PRACTICALS HEMATOLOGY**

- Use of the microscope
- Determination of haemoglobin
- Determination of erythrocyte sedimentation rate
- Determining packed cell volume
- Measuring bleeding and clotting time
- RBC count
- Red cell indices
- WBC count
- Leukocyte count
- Prothrombin and thrombin time

## **RESPIRATORY SYSTEM**

- Clinical examination of chest
- Pulmonary volume, their capacities and clinical interpretation
- Stethography

## **ENGLISH -II**

### **COURSE DESCRIPTION**

Enable the students to meet their real life communication needs

### **COURSE CONTENTS**

#### **PARAGRAPH WRITING**

Practice in writing a good, unified and coherent paragraph

#### **ESSAY WRITING**

Introduction

#### **CV AND JOB APPLICATION**

Translation skills

Urdu to English

#### **STUDY SKILLS**

Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension

### **ACADEMIC SKILLS**

Letter/memo writing, minutes of meetings, use of library and internet

### **PRESENTATION SKILLS**

Personality development (emphasis on content, style and pronunciation)

Note: documentaries to be shown for discussion and review

### **RECOMMENDED BOOKS**

- Communication Skills
- Grammar
- Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.
- Writing
- Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
- Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).
- Reading
- Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
- Reading and Study Skills by John Langan
- Study Skills by Richard Yorky.

## **ISLAMIC STUDIES**

### **COURSE DESCRIPTION**

This course is aimed at:

- To provide Basic information about Islamic Studies
- To enhance understanding of the students regarding Islamic Civilization

- To improve Students skill to perform prayers and other worships
- To enhance the skill of the students for understanding of issues related to faith and religious life.

### **INTRODUCTION TO QURANIC STUDIES**

- Basic Concepts of Quran
- History of Quran
- Uloom-ul -Quran

### **STUDY OF SELECTED TEXT OF HOLLY QURAN**

- Verses of Surah Al-Baqra Related to Faith (Verse No-284-286)
- Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
- Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
- Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
- Verses of Surah Al-Inam Related to Ihkam (Verse No-152-154)

### **STUDY OF SELECTED TEXT OF HOLLY QURAN**

- Verses of Surah Al-Ihزاب Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
- Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)

### **SEERAT OF HOLY PROPHET (S.A.W) I**

- Life of Muhammad Bin Abdullah ( Before Prophet Hood)
- Life of Holy Prophet (S.A.W) in Makkah
- Important Lessons Derived from the life of Holy Prophet in Makkah

### **SEERAT OF HOLY PROPHET (S.A.W) II**

- Life of Holy Prophet (S.A.W) in Madina
- Important Events of Life Holy Prophet in Madina
- Important Lessons Derived from the life of Holy Prophet in Madina

### **INTRODUCTION TO SUNNAH**

- Basic Concepts of Hadith
- History of Hadith
- Kinds of Hadith

- Uloom –ul-Hadith
- Sunnah & Hadith
- Legal Position of Sunnah

### **SELECTED STUDY FROM TEXT OF HADITH**

- INTRODUCTION TO ISLAMIC LAW & **JURISPRUDENCE**
- Basic Concepts of Islamic Law & Jurisprudence
- History & Importance of Islamic Law & Jurisprudence
- Sources of Islamic Law & Jurisprudence
- Nature of Differences in Islamic Law
- Islam and Sectarianism

### **ISLAMIC CULTURE & CIVILIZATION**

- Basic Concepts of Islamic Culture & Civilization
- Historical Development of Islamic Culture & Civilization
- Characteristics of Islamic Culture & Civilization
- Islamic Culture & Civilization and Contemporary Issues

### **ISLAM & SCIENCE**

- Basic Concepts of Islam & Science
- Contributions of Muslims in the Development of Science
- Quranic & Science

### **ISLAMIC ECONOMIC SYSTEM**

- Basic Concepts of Islamic Economic System
- Means of Distribution of wealth in Islamic Economics
- Islamic Concept of Riba
- Islamic Ways of Trade & Commerce

### **POLITICAL SYSTEM OF ISLAM**

- Basic Concepts of Islamic Political System
- Islamic Concept of Sovereignty
- Basic Institutions of Govt. in Islam



## **ISLAMIC HISTORY**

- Period of Khlaft-E-Rashida
- Period of Ummayyads
- Period of Abbasids

## **SOCIAL SYSTEM OF ISLAM**

- Basic Concepts of Social System of Islam
- Elements of Family
- Ethical Values of Islam

## **RECOMMENDED BOOKS**

- Hameed ullah Muhammad, "Emergence of Islam" , IRI, Islamabad
- Hameed ullah Muhammad, "Muslim Conduct of State"
- Hameed ullah Muhammad, 'Introduction to Islam
- Mulana Muhammad Yousaf Islahi,"
- Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
- Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
- Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes" Islamic Book Service (1982)
- H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)
- Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

## **MECHANICS AND MATHEMATICS**

### **MECHANICS OF EQUILIBRUM**

- Newton's laws of motion
- Mass and inertia
- Vector and scalar quantities
- Kinematics and kinetics

- Force and the effects of force
- Friction
- Parallel and non-parallel forces
- Polygon of forces
- Resolution of forces and moments in two and three dimensions
- Resolution of force vectors
- Momentum
- Free body diagrams

### **MECHANICS OF LINEAR MOTION**

- Displacement and velocity
- Acceleration and retardation
- Considering inertia, momentum and friction

### **MECHANICS OF ANGULAR MOTION**

- Circular motion
- Torque
- Relationship between linear and angular motion
- Angular speed, velocity and acceleration
- Moment of inertia
- Centrifugal and centripetal forces
- Parallel and perpendicular axis rules

### **BENDING MOMENTS AND SHEAR FORCE**

- Bending moments and shear force in simply supported beams
- Bending moments and shear force diagrams
- Deflection of beams
- Cantilevered beams

### **STRENGTH OF MATERIALS**

- Stress
- Strain
- Yield strength
- Hooke's Law
- Shear stress

### **WORK, POWER AND ENERGY**

- Kinetic energy
- Potential energy
- Power
- Work

### **RECOMMENDED TEXT BOOKS:**

1. *Engineering Mechanics* by R.P. Hibbeler
2. *Physics* by Resnick A. Halliday 4<sup>th</sup> Edition

3. *Engineering Statics* by R. C. Hibber (Latest Edition)

## **MATHEMATICS**

### **COURSE DESCRIPTION:**

The Mathematics course is aimed at revising and reinforcing numeracy skills previously covered in their high school classes so that the students are adequately prepared for the Mechanics and Bio-mechanics courses to follow.

### **ARITHMETIC AND ALGEBRA**

- Prime and composite numbers
- Fractions
- Linear Equations
- Quadratic Equations
- Properties, Ratios and Percentages
- Integer Exponents
- Absolute Value Equations
- Absolute Value Inequalities
- Cartesian Coordinate System
- Relations
- Functions
- Functions of Functions
- Exponential and Logarithmic Equations

### **GEOMETRY**

- Measurement
- Straight Lines
- Angles
- Pythagoras
- Standard triangles
- Areas
- Volumes
- Trigonometry

### **CALCULUS**

- Tangent lines, limits and continuity
- Derivatives
- Applications of differentiation
- Applications of integration

### **RECOMMENDED TEXT BOOKS:**

1. *Essentials of Mathematics Book 1 and 2* by Prof. Adam Khan.

## **APPLIED PROSTHETICS AND ORTHOTICS - II**

### **ANKLE FOOT ORTHOTICS (AFO) - Theory**

- Revision of internal and surface anatomy of the lower leg
- Revision of the biomechanics concerning the normal foot and leg
- Common foot deformities and the pathologies that produce them
- Revision of normal and pathological gait
- Material and components
- Device design and corrective forces
- When a rigid, articulated or flexible AFO is indicated
- Check-out, delivery and follow-up

### **ANKLE FOOT ORTHOTICS - Demonstration**

- Static and dynamic assessment of the foot and ankle
- Formulation of functional loss
- Device design and corrective forces
- Casting and measurements
- Rectification of the positive model
- AFO (rigid and jointed) manufacture
- Fitting - static and dynamic alignment
- Finishing
- Check-out, delivery and follow-up

### **ANKLE FOOT ORTHOTICS – Practical**

- Static and dynamic assessment of the foot
- Formulation of functional loss
- Device design and corrective forces
- Casting and measurements
- Rectification of the positive model
- AFO (rigid and jointed) manufacture
- Fitting - static and dynamic alignment
- Finishing
- Check-out, delivery and follow-up

### **TRANS-TIBIAL PROSTHETICS - Theory**

- Revision of internal and surface anatomy of the lower limb
- Causes of TT amputation and their effect on prosthetic outcome
- Amputation and stump shape
- Revision of the biomechanics of the TT prosthesis

- Common stump problems and the required action
- Revision of normal and prosthetic gait
- Material and components
- Device design and indications (endo/exoskeletal, patella tendon bearing, total surface bearing, supracondylar, suprapatellar, etc.)
- Check-out, delivery and follow-up

### **TRANS-TIBIAL PROSTHETICS - Demonstration**

- Static and dynamic assessment the TT amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- TT prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **TRANS-TIBIAL PROSTHETICS – Practical**

- Static and dynamic assessment the TT amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- TT prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **ANKLE DISARTICULATION (AD) AND PATIAL FOOT (PF) PROSTHETICS - Theory**

- Revision of internal and surface anatomy of the lower limb
- Causes of AD and PF amputation and their effect on prosthetic outcome
- Amputation and stump shape
- Revision of the biomechanics of the AD and PF prosthesis
- Common stump problems and the required action
- Revision of normal and prosthetic gait

- Material and components
- Device design
- Check-out, delivery and follow-up

## **ANKLE DISARTICULATION (AD) AND PATIAL FOOT (PF) PROSTHETICS -**

### **Demonstration**

- Static and dynamic assessment of the AD and PF amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- AD and PF prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **ANKLE DISARTICULATION (AD) AND PATIAL FOOT (PF) PROSTHETICS – Practical**

- Static and dynamic assessment the AD and PF amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- AD and PF prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **RECOMMENDED TEXT BOOKS:**

1. *ICRC Physical Rehabilitation Programme, Lower Limb Orthotics – Ankle Foot Orthotics* – ICRC
2. *Trans-tibial Prosthetics (Tome 1 and 2)* - ICRC/CSPO
3. *ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Trans-tibial Prosthesis* <https://www.icrc.org/eng/assets/files/other/eng-transtibial.pdf>
4. *Partial Foot Prosthetics Course Work Manual* - ICRC/CSPO
5. *Ankle Disarticulation Course Work Manual* – ICRC/CSPO

6. ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Ankle Foot Orthotics <https://www.icrc.org/eng/assets/files/other/eng-afo.pdf>
7. ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Partial Foot Prosthetics <https://www.icrc.org/eng/assets/files/other/eng-partial-foot.pdf>
8. ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Symes Prosthesis with Medial Window. <https://www.icrc.org/eng/assets/files/.../icrc-mg-symes-medwindow-web-0868.pdf>
9. ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Symes Prosthesis Push-fit. <https://www.icrc.org/eng/assets/files/.../icrc-mg-symes-pushfit-web-0868.pdf>
10. AAOS Atlas of Orthoses and Assistive Devices by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
11. Atlas of Amputations and Limb Deficiencies by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
12. Orthotics and Prosthetics Rehabilitation by Lusardi, Jorge and Nielsen, Elsevier



### THIRD SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
<b>RSC 622</b>	ANATOMY –III	<b>3(2-1)</b>
<b>RSC 623</b>	PHYSIOLOGY-III	<b>3 (2-1)</b>
<b>RSC 621</b>	ENGLISH-III	<b>3(3-0)</b>
<b>OP 621</b>	APPLIED PROSTHETICS& ORTHOTICS III	<b>3(3-0)</b>
<b>OP 622</b>	MATERIAL SCIENCE	<b>3(2-1)</b>
<b>OP 623</b>	ELECTRO-TECHNOLOGY	<b>3(3-0)</b>
		<b>18</b>



## **ANATOMY -III**

### **COURSE DESCRIPTION**

The focus of this course is an in-depth study and analysis of the regional and systemic organization of the body. Emphasis is placed upon structure and function of human movement. A comprehensive study of human anatomy with emphasis on the nervous, skeletal, muscle, and circulatory systems is incorporated. Introduction to general anatomy lays the foundation of the course. Dissection and identification of structures in the cadaver supplemented with the study of charts, models, prosected materials and radiographs are utilized to identify anatomical landmarks and configurations of the head and neck

### **EMBRYOLOGY**

#### **GENERAL EMBRYOLOGY**

- Male and female reproductive organs.
- Cell division and Gametogenesis.
- Fertilization, cleavage, blastocyst formation and implantation of the embryo. Stages of early embryonic development in second and third week of intrauterine life
- Foetal membrane (amniotic cavity, yolk sac, allantois, umbilical cord and Placenta).
- Developmental defects

#### **SPECIAL EMBRYOLOGY**

- Musculoskeletal system
- Cardiovascular system
- CNS

### **HEAD AND NECK**

#### **NECK**

- Muscles around the neck
- Triangles of the neck

- Main arteries of the neck
- Main veins of the neck
- Cervical part of sympathetic trunk
- Cervical plexus
- Cervical spine (Vertebrae)
- Joint of neck

## **FACE**

- Sensory nerves of the face
- Bones of the face
- Muscles of the face
- Facial nerve
- Muscles of mastication
- Mandible
- Hyoid bone
- Temporomandibular joint
- Brief description of orbit and nasal cavity

## **SKULL**

- Bones of skull
- Anterior cranial fossa
- Middle cranial fossa
- Posterior cranial fossa
- Base of skull
- Structures passing through foramina

## **PRACTICAL**

During study of Gross Anatomy, emphasis should be given on applied aspect, radiological anatomy, surface anatomy and cross-sectional anatomy of the region covered in the respective semester /year.

## **RECOMMENDED BOOKS**

- Gray's Anatomy by Prof. Susan Standring 39th Ed., Elsevier.
- Clinical Anatomy for Medical Students by Richard S.Snell.
- Clinically Oriented Anatomy by Keith Moore.
- Clinical Anatomy by R.J. Last, Latest Ed.
- Cunningham's Manual of Practical Anatomy by G.J. Romanes, 15th Ed., Vol-I, II and III.
- The Developing Human. Clinically Oriented Embryology by Keith L. Moore, 6th Ed.

- Wheater's Functional Histology by Young and Heath, Latest Ed.
- Medical Histology by Prof. Laiq Hussain.
- Neuroanatomy by Richard S.Snell

## **PHYSIOLOGY -III**

### **COURSE DESCRIPTION**

The course is designed to study the function of the human body at the molecular, cellular, tissue and systems levels, The major underlying themes are: the mechanisms for promoting homeostasis; cellular processes of metabolism, membrane function and cellular signaling; the mechanisms that match supply of nutrients to tissue demands at different activity levels; the mechanisms that match the rate of excretion of waste products to their rate of production; the mechanisms that defend the body against injury and promote healing. These topics are addressed by a consideration of nervous and endocrine regulation of the cardiovascular, hematopoietic, pulmonary, renal, gastrointestinal, and musculoskeletal systems, including the control of cellular metabolism. The integrative nature of physiological responses in normal function and disease is stressed throughout. This course provides the foundation for the further course as exercise physiology, pathology, etc.

### **NERVOUS SYSTEM**

- General organization of the nervous system
- Classification of nerve fibers
- Properties of synaptic transmission
- Function of neurotransmitters and neuropeptides
- Type and function of sensory receptors
- Function of the spinal cord and ascending tracts
- Reflex action and reflexes
- Muscle spindle and muscle tone
- Mechanism of touch
- Temperature and pain
- Functions of the cerebral cortex
- Difference between the sensory and motor cortex and their functions
- Motor pathways including pyramidal and extrapyramidal
- Basal Ganglia and its functions
- Cerebellum and its function
- Control of posture and equilibrium

- Physiology of sleep
- Physiology of memory
- Mechanism and control of speech
- Function of the thalamus
- Function of the hypothalamus and limbic system
- Production of CSF
- Mechanism of temperature regulation
- Function of the autonomic nervous system and the physiological changes of aging

### **CLINICAL MODULE**

- Significance of dermatomes
- Injuries of the spinal cord
- Hemiplegia and paraplegia
- Parkinsonism
- Effects of cerebellar dysfunction

### **REPRODUCTION**

- Function of the male reproductive system, Spermatogenesis
- Mechanism of erection and ejaculation
- Production and function of testosterone and Physiological changes during male puberty
- Function of the female reproductive system
- Production and function of oestrogen, and progesterone
- Menstrual cycle
- Physiological changes during female puberty and menopause
- Pregnancy and the physiological changes taking place
- Function of the placenta
- Parturition and lactation
- Neonatal physiology

### **CLINICAL MODULE**

- Male infertility
- Female infertility
- Contraception
- Basis for pregnancy tests

### **BODY FLUIDS AND KIDNEY**

- Components and quantitative measurements of body fluids
- Fluid compartments, tissue and lymph fluid

- Structure of the kidney and nephron
- General function of the kidney
- GFR and its regulation
- Formation of urine including filtration, re-absorption and secretion
- Plasma clearance, Mechanism of concentration and dilution of urine
- Water and electrolyte balance with reference to the kidney
- Role of the kidney in blood pressure regulation
- Hormonal functions of the kidney
- Acidification of urine and its importance
- Acid base balance with reference to the kidney
- Micturition and its control

### **CLINICAL MODULE**

- Renal function tests and their clinical importance
- Fluid excess and depletion
- Renal failure and dialysis
- Metabolic acidosis and alkalosis
- Abnormalities of micturition

### **PRACTICALS**

#### **NERVOUS SYSTEM**

- Examination of superficial and deep reflexes
- Brief examination of the motor and sensory system
- Examination of the cranial nerves

#### **SPECIAL SENSES**

- Measurement of the field of vision
- Measurement of light reflex
- Ophthalmoscopy
- Colour vision
- Hearing tests
- Testing taste and smell

#### **PREGNANCY TESTS**

## RECOMMENDED BOOKS

- Textbook of Physiology by Guyton and Hall, Latest Ed.
- Review of Medical Physiology by William F. Ganong, Latest Ed.
- Physiology by Berne and Levy, Latest Ed.
- Human Physiology: The Basis of Medicine by Gillian Pocock, Christopher D. Richards
- Physiological Basis of Medical Practice by John B. West and Taylor, 12th Ed.

## ENGLISH -III

### COURSE DESCRIPTION

Enhance language skills and develop critical thinking

### PRESENTATION SKILLS

How to prepare and deliver a successful presentation

### ESSAY WRITING

Descriptive, narrative, discursive, argumentative

### ACADEMIC WRITING

How to write a proposal for research paper/term paper

How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)

### TECHNICAL REPORT WRITING

Progress report writing

Extensive reading is required for vocabulary building

### RECOMMENDED BOOKS

- Technical Writing and Presentation Skills
- Essay Writing and Academic Writing
- Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).
- College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.
- Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.
- Presentation Skills
- Reading
- The Mercury Reader. A Custom Publication. Compiled by northern Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharton. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).

## **APPLIED PROSTHETICS AND ORTHOTICS - III**

### **COURSE DESCRIPTION:**

Students will continue their education in prosthetics and orthotics with trans-femoral and knee disarticulation prosthetics. Through theory, practical and patient contact sessions, students will learn how to assess the patient, design an appropriate device, cast, modify the cast and manufacture the device. When the device is ready for fitting, the student will learn how to safely fit his or her device, identify common fitting issues and gait deviations and perform the required adjustments. When the optimum fit and alignment has been achieved the student will perform the final finishing of the device and learn the proper procedure for delivering the device to the patient and necessary follow-up.

### **TRANS FEMORAL (TF) PROSTHETICS - Theory**

- Revision of internal and surface anatomy of the lower limb
- Causes of AD and PF amputation and their effect on prosthetic outcome
- Amputation and stump shape
- Revision of the biomechanics of TF prosthesis
- Common stump problems and the required action
- Revision of normal and prosthetic gait
- Material and components
- Device design
- Check-out, delivery and follow-up

### **TRANS FEMORAL (TF) PROSTHETICS - Demonstration**

- Static and dynamic assessment of the TF amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- TF prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **TRANS FEMORAL (TF) PROSTHETICS – Practical**

- Static and dynamic assessment the TF amputee
- Formulation of functional loss

- Device design
- Casting and measurements
- Rectification of the positive model
- TF prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **KNEE DISARTICULATION (KD) PROSTHETICS - Theory**

- Revision of internal and surface anatomy of the lower limb
- Causes of KD amputation and their effect on prosthetic outcome
- Amputation and stump shape
- Revision of the biomechanics of KD prosthesis
- Common stump problems and the required action
- Revision of normal and prosthetic gait
- Material and components
- Device design
- Check-out, delivery and follow-up

### **KNEE DISARTICULATION (KD) PROSTHETICS - Demonstration**

- Static and dynamic assessment of the KD amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- KD prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **KNEE DISARTICULATION (KD) PROSTHETICS – Practical**

- Static and dynamic assessment the KD amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- KD prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment



- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **RECOMMENDED TEXT BOOKS:**

1. *Trans Femoral Prosthetics Course Work Manual (Tome 1 and 2)*- ICRC/CSPO
2. *Knee Disarticulation Prosthetics Course Work Manual* – ICRC/CSPO
3. *ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Trans Femoral Prosthetics* <https://www.icrc.org/eng/assets/files/other/eng-transfemoral.pdf>
4. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
5. *Atlas of Amputations and Limb Deficiencies* by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
6. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier

## **MATERIAL SCIENCE**

### **COURSE DESCRIPTION:**

When designing a suitable device for a patient, it is essential for the prosthetist-orthotist to have a good background knowledge of the properties and limitations of the materials at his disposal. The Material Science course examines the materials commonly available in the P&O workshop from their chemical composition to how this effects their characteristics and, therefore the uses available and design considerations to take into account.

### **CONTENTS:**

#### **PROPERTIES OF MATERIALS**

- Ductility, malleability, hardness, heat/electrical conductivity, resistance to corrosion, weight, etc.
- The properties of various materials commonly used in P&O
  - Metals
  - Polymers (Polyurethane, polyethylene, polypropylene, EVA, PPT, etc.)
  - Ceramics
  - Composites

#### **CHEMICAL STRUCTURE OF MATERIALS**

- Ferrous and non-ferrous metals and their alloys
- Production processes and their effect on material structure
- Ceramics and composites
- Polymers (thermoplastics and thermosetting plastics)

- Production processes and their effect on the mechanical properties of materials
  - Forging
  - Casting
  - Extrusion
  - Rolling
  - Drawing
  - Sintering

### **MECHANICAL FAILURE**

- Types of failure such as brittle fracture, ductile fatigue, shear, corrosion, etc.
- Improving mechanical properties
  - Heat treatment
  - Alloys
  - Plating/anodizing/galvanizing
  - Lamination

### **MATERIALS USED IN P&O**

- Available forms of:
  - Plaster of Paris
  - Fabrics
  - Polymers (Flexible and rigid foams, rigid sheets)
  - Leather
  - Rubber and silicone
  - Metals
- Factors regarding choice of materials
- Design considerations

### **RECOMMENDED TEXT BOOKS:**

1. *Callister's Materials Science and Engineering* by William D. Callister, Jr.
2. *The Science and Engineering of Materials* by Donald R. Asklund
3. *Materials and Processes in Manufacturing* by E. P. Degarmo
4. *A Text Book of Workshop Technology* by R. S. Khurmi and J. K. Gupta
5. *Processes and Materials of Manufacturing* by Linberg
6. *Biomaterials: An Introduction* by Joon Park and R. S. Lakes, Springer

## **ELECTROTECHNOLOGY**

### **COURSE DESCRIPTION:**

With advancement in technology, electronics are being used more and more in P&O. For students to have a better understanding how electronics can be used in P&O today. This course aims at offering students an insight into their uses as well as providing a general outline of the principals behind electro-technology. These principals form the essential building blocks of all electrical interfaces used in P&O applications.

## **CONTENT:**

### **LECTURES**

#### **BASIC CONCEPTS**

- The SI System of units
- Charge, current, resistance, potential difference, electromotive force (EMF)
- The relationship between resistance, voltage and current (Ohms Law)
- AC and DC circuits
- Sine waves
- Induction and capacitance
- Power

#### **AC & DC Circuits**

- Kirchoff's Law
- Resistors in series and parallel
- Measurement of resistance
- Resistivity and conductivity
- Temperature coefficient of resistance
- Sine wave (frequency, period, phase, min/peak/mean values, RMS)
- Impedance
- Circuit diagrams

#### **COMPONENTS**

- Resistors and capacitors
- Transformers
- Semi-conductors (transistors)
- Amplifiers
- Motors

#### **MEASUREMENT**

- Electronic measuring instruments
- Recoding instruments
- Concepts of resolution and accuracy
- Transducers: analogue to digital and digital to analogue

## FEEDBACK

- The feedback equation
- A feedback loop
- Feedback loop control
- Feedback loop gain
- Noise and bandwidth of noise
- Positive and negative feedback
- Instability and self-oscillation in amplifiers

## ELECTRICAL SAFETY

- Fuses
- Miniature Circuit Breaker (MCB)
- Earth circuits
- Lightning conductors
- Voltage regulation

## ELECTRO-TECHNOLOGY IN P&O

- Biological potentials (muscle action potential)
- Electro-myography and myo-electricity
- Metal paste electrodes
- Electrode stability
- Micro switches
- Lower limb control
- Electrical component fabrication

## RECOMMENDED TEXT BOOKS:

1. *Basic Electronics* by B.L. Thereja
2. *Biological & Medical Electronics* by Ralph W. Stach Ph.D.

## FORTH SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
RSC 631	ANATOMY IV	3(3-0)
RSC 632	BIOMECHANICS & ERGONOMICS II	3(2-1)
RSC 633	BEHAVIORAL SCIENCES (PSYCHIATRY & PSYCHOLOGY)	3(3-0)
PO 631	APPLIED PROSTHETICS AND ORTHOTICS IV	3(1+2)
PO 632	ADVANCED PROSTHETICS	3(2-1)
PO 623	WORKSHOP TECHNOLOGY	3(2-1)
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**Course Description:**

The focus of this course is an in-depth study and analysis of the regional and systemic organization of the body. Emphasis is placed upon structure and function of human movement. A comprehensive study of human anatomy with emphasis on the nervous, skeletal, muscle, and circulatory systems is incorporated. Introduction to general anatomy lays the foundation of the course. Dissection and identification of structures in the cadaver supplemented with the study of charts, models, prosected materials and radiographs are utilized to identify anatomical landmarks and configurations of the region

**Neuro Anatomy**

- Central Nervous System: Disposition, Parts and Functions
- Brain stem (Pons, Medulla, and Mid Brain)
- Cerebrum
- Cerebellum
- Thalamus
- Hypothalamus
- Internal Capsule
- Blood Supply of Brain
- Stroke and its types
- Ventricles of Brain
- CSF circulation and Hydrocephalus
- Meninges of Brain
- Neural pathways (Neural Tracts)
- Pyramidal and Extra pyramidal System (Ascending and Descending tracts)
- Functional significance of Spinal cord level
- Cranial Nerves with special emphasis upon IV, V, VII, XI, XII (their course, distribution, and palsies).
- Autonomic nervous system, its components
- Nerve receptors

**SPINAL CORD**

- Gross appearance
- Structure of spinal cord
- Grey and white matter (brief description)
- Meninges of spinal cord

- Blood supply of spinal cord
- Autonomic Nervous system

### **Practical**

During study of Gross Anatomy, emphasis should be given on applied aspect, radiological anatomy, surface anatomy and cross-sectional anatomy of the region covered in the respective semester /year

### **Recommended Text Books:**

- *Gray's Anatomy* by Prof. Susan Standring 39th Ed., Elsevier.
- *Clinical Anatomy for Medical Students* by Richard S.Snell.
- *Clinically Oriented Anatomy* by Keith Moore.
- *Clinical Anatomy* by R.J. Last, Latest Ed.
- *Cunningham's Manual of Practical Anatomy* by G.J. Romanes, 15th Ed., Vol-I, II and III.
- *The Developing Human. Clinically Oriented Embryology* by Keith L. Moore, 6th Ed.
- *Wheater's Functional Histology* by Young and Heath, Latest Ed.
- *Medical Histology* by Prof. Laiq Hussain.

## **BIOMECHANICS & ERGONOMICS II**

### **Course Description**

This course aims to develop appreciation of how mechanical principles can be applied to understand the underlying causes of human movement. It also examines selected anatomical, structural and functional properties of human connective, muscular, and nervous tissues, as well as skeletal structures. Emphasis is placed on the mechanical, neuroregulatory, and muscular events that influence normal and pathological motion

This course will also help to gain an understanding of basic theoretical concepts, principles and techniques of ergonomics as well as an introduction to fundamental ergonomic measurement tools for assessment of physical workload, posture, occupational exposure, and stress.

## **DETAILED COURSE OUTLINE:**

### Basic terminology

- Biomechanics
- Mechanics
- Dynamics
- Statics
- Kinematics
- Kinetics and anthropometries
- Scope of scientific inquiry addressed by biomechanics
- Difference between quantitative and qualitative approach for analyzing human movements
- Biomechanics of human bone growth and development

### **Kinematic Concepts For Analyzing Human Motion**

- Common units of measurement for mass, force, weight, pressure, volume, density, specific weight, torque and impulse
- Different types of mechanical loads that act on human body.
- Uses of available instrumentation for measuring kinetic quantities

### **Biomechanics of Tissues and Structures of the Musculoskeletal System**

- Biomechanics of Bone
- Biomechanics of Articular Cartilage
- Biomechanics of Tendons and Ligaments
- Biomechanics of Peripheral Nerves and Spinal Nerve Roots
- Biomechanics of Skeletal Muscles

### **Biomechanics of the Human Upper Extremity**

- Biomechanics of the Shoulder
- Biomechanics of the Elbow
- Biomechanics of the Wrist and Hand
- Factors that influence relative mobility and stability of upper extremity articulation
- Muscles that are active during specific upper extremity movements
- Biomechanical contributions to common injuries of the upper extremity

### **Biomechanics of Human Lower Extremity**

- Biomechanics of the Hip



- Biomechanics of the Knee
- Biomechanics of the ankle and foot
- Factors influencing relative mobility and stability of lower extremity articulations
- Adaptation of lower extremity to its weight bearing functions
- Muscles that are active in specific lower extremity movements
- Biomechanical contribution to common injuries of the lower extremity

## **ERGONOMICS**

### **OVERVIEW AND CONCEPTUAL FRAMEWORK.**

- Ergonomics and Therapy: An Introduction.
- A Client-Centered Framework for Therapists in Ergonomics.
- Macroergonomics.

### **KNOWLEDGE, TOOLS, AND TECHNIQUES.**

- Ergonomic Assessments/Work Assessments.
- Anthropometry
- Cognitive and Behavioral Occupational Demands of Work.
- Psychosocial Factors in Work-Related Musculoskeletal Disorders.
- Physical Environment.
- Human Factors in Medical Rehabilitation Equipment: Product Development and Usability Testing.

### **Biomechanics of Human Spine**

- Biomechanics of the Lumbar Spine
- Biomechanics of the Cervical Spine
- Factors influencing relative mobility and stability of different regions of Spine
- Biomechanical adaptations of spine during different functions
- Relationship between muscle location and nature and effectiveness of muscle action in the trunk
- Biomechanical contribution to common injuries of the spine

### **Applied Biomechanics**

- Introduction to the Biomechanics of Fracture Fixation

- Biomechanics of Arthroplasty
- Engineering Approaches to Standing, Sitting, and Lying
- Biomechanics of Gait

### **Angular Kinetics Of Human Movement**

- Angular analogues of mass, force, momentum and impulse
- Angular analogues of Newton's laws of motion
- Centripetal and Centrifugal forces
- Angular acceleration

### **Angular Kinematics Of Human Movement**

- Measuring body angles
- Angular kinematics Relationships
- Relationship between Linear and Angular motion

### **Human Movement In Fluid Medium**

- The nature of fluids
- Buoyancy and floatation of human body
- Drag and components of drag
- Lift Force
- Propulsion in a fluid medium

## **ERGONOMICS II**

### **SPECIAL CONSIDERATIONS.**

- Lifting Analysis.
- Seating.
- Computers and Assistive Technology.

### **APPLICATION PROCESS.**

- Ergonomics of Children and Youth.
- Ergonomics of Aging.
- Ergonomics in Injury Prevention and Disability Management.
- Ergonomics of Play and Leisure.

### **• PRACTICAL TRAINING / LAB WORK**

- Biomechanical assessment of Upper extremity

- Biomechanical assessment of Lower Extremity
- Biomechanical assessment of Gait
- Reflective case assignment related to biomechanics of various regions of the body
- Measurement of angles of joints
- Biomechanical study of deformities

### **RECOMMENDED TEXT BOOKS**

- Basic biomechanics of musculoskeletal system By: Nordin & Frankel, 3rd edition.
- Basic Biomechanics, By: Susan J. Hall 4th edition.
- Additional study material as assigned by the tutor.
- Ergonomics for the therapist by Karen Jacobs 3rd edition mosby and Elsevier publishers.

### **BEHAVIORAL SCIENCES**

**CREDIT 3(3-0)**

***(Psychiatry & Psychology)***

#### **Course Description**

This course is designed to increase awareness of psychosocial issues faced by individuals and their significant reference groups at various points on the continuum of health and disability, including factors that influence values about health promotion, wellness, illness and disability. Personal and professional attitudes and values are discussed as they relate to developing therapeutic relationships. Communication skills are emphasized for effective interaction with clients, health-care professionals and others

#### **Detailed Course Outline:**

- Behavioural Sciences and their importance in health
- Bio-Psycho-Social Model of Healthcare
- Desirable attitudes
- Correlation of brain, mind and Behavioural Sciences
- Roles of a doctor

#### **Understanding Behaviour**

- Sensation, sense organs / special organs
- Perception and factors affecting it
- Attention and concentration
- Memory and its stages, types and methods to improve it
- Types and theories of thinking
- Cognition and levels of cognition
- Problem solving and decision making strategies
- Communication Its types, modes and factors affecting it Non-verbal cues
- Characteristics of a good communicator

### **Personality and Intelligence**

- Stages and characteristics of psychological growth and development
- Personality and development theories of personality Factors affecting personality development
- Assessment of personality Influence of personality in determining reactions during health, disease, hospitalization, stress, etc
- Intelligence and its types Relevance of IQ and EQ Methods of enhancing EQ and effectively using IQ Factors affecting intelligence and their assessment

### **Stress Management**

- Definition and classification of stress and stressors
- Relationship of stress and stressors with illness
- Stress and health
- Anxiety
- Coping skills
- Psychological defence mechanisms
- Conflict and frustration
- Adjustment and maladjustment
- Patient anxiety / stress
- Psychological theories of pain perception and patients' experience of pain Treatment adherence and compliance
- Psychological techniques including hypnosis

### **Doctor – Patient Relationship**

- Concept of boundaries and psychological reactions in doctor – patient relationship (such as transference and counter transference)

### **Pain, Sleep and Consciousness**

- Concept of pain
- Physiology of pain, psychosocial assessment and management of chronic /intractable atypical facial pain
- Stages of sleep
- Physiology of consciousness
- Attend states of consciousness

- Psychological influence on sleep and consciousness
- Non-pharmacological methods of inducing sleep
- Changes in consciousness

### **Communication Skills**

- Principles of effective communication
- Active listening
- Art of questioning
- Good and bad listener
- Counseling: steps, scope, indication and contraindications
- Dealing with real life crisis and conflict situations in health settings
- A practical method of communication between the doctor and patient about disease, drugs, prognosis etc

### **Interviewing**

- Collecting data on psychosocial factors in Medicine / Surgery / Reproductive Health / Paediatrics and other general health conditions
- Types of interview
- Skills of interviewing

### **Health Psychology**

- Importance of psychological consideration in clinical management of patients
- Psychological therapies
- Key concepts in child's social and cognitive development
- Psychological changes during adolescence and old age and their clinical management
- Impact of illness on a patient's psychological well being including the ability to cope and understand the association between psychological stress and physical well being
- Role of doctor in patient reassurance and allaying anxiety and fear

### **Social and Community Perspective**

- Inequalities of healthcare and the relationship of social class
- Ethnicity, culture and racism, How disease pattern and medical care vary by culture and ethnicity?
- Gender and Healthcare
- Influence of health and illness on behaviour

### **Application of Behavioural Principles in Health and Disease**

- Mentally / emotionally handicapped
- Physically handicapped
- Chronically ill
- Homebound
- Medically compromised

### **Recommended Text Books:**

1. *A Handbook of Behavioural Sciences for Medical and Dental Students* By: Mowadat H Rana, Sohail Ali and Mansoor Mustafa, , University of Health Sciences Lahore
2. *Medicine in Society ; Behavioural Sciences for Medical Students,* By: Christopher Dowrick, , Arnold Publisher
3. *Behavioural Sciences in Clinical Medicine* By: Wolf & Stewart
4. *Developmental Psychology for Healthcare Professions* By: Katherine A Billingham

## **APPLIED PROSTHETICS AND ORTHOTICS -**

### **COURSE DESCRIPTION:**

Students will continue their education in prosthetics and orthotics with knee ankle foot orthotics (KAFO), knee orthotics (KO), hip knee ankle foot orthotics (HKAFO) and hip disarticulation prosthetics. Through theory, practical and patient contact sessions, students will learn how to assess the patient, design an appropriate device, cast, modify the cast and manufacture the device. When the device is ready for fitting, the student will learn how to safely fit his or her device, identify common fitting issues and gait deviations and perform the required adjustments. When the optimum fit and alignment has been achieved the student will perform the final finishing of the device and learn the proper procedure for delivering the device to the patient and necessary follow-up.

### **KNEE ANKLE FOOT, KNEE AND HIP ORTHOTICS (KO, KAFO & HKAFO) - Theory**

- Revision of internal and surface anatomy of the pelvis and lower limb
- Revision of the biomechanics concerning the normal gait
- Common pathologies where a KO, KAFO or HKAFO is indicated
- Revision of normal and pathological gait
- Materials and components (prefabricated/custom made)
- Device design and corrective forces
- Check-out, delivery and follow-up

### **KNEE ANKLE FOOT ORTHOTICS (KAFO) - Demonstration**

- Static and dynamic assessment of the lower limb
- Formulation of functional loss
- Device design and corrective forces
- Casting and measurements
- Rectification of the positive model
- KAFO manufacture

- Fitting - static and dynamic alignment
- Finishing
- Check-out, delivery and follow-up

### **KNEE ANKLE FOOT ORTHOTICS (KAFO) – Practical**

- Static and dynamic assessment of the lower limb
- Formulation of functional loss
- Device design and corrective forces
- Casting and measurements
- Rectification of the positive model
- KAFO manufacture
- Fitting - static and dynamic alignment
- Finishing
- Check-out, delivery and follow-up

### **HIP DISARTICULATION (HD) PROSTHETICS - Theory**

- Revision of internal and surface anatomy of the pelvis and lower limb
- Causes of HD amputation and their effect on prosthetic outcome
- Amputation and stump shape
- Revision of the biomechanics of KD prosthesis
- Common stump problems and the required action
- Revision of normal and prosthetic gait
- Material and components
- Device design
- Check-out, delivery and follow-up

### **HIP DISARTICULATION (HD) PROSTHETICS - Demonstration**

- Static and dynamic assessment of the HD amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- HD prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **HIP DISARTICULATION (HD) PROSTHETICS – Practical**

- Static and dynamic assessment the HD amputee
- Formulation of functional loss
- Device design



- Casting and measurements
- Rectification of the positive model
- HD prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

#### **METHODS OF ASSESSMENT:**

<b>Assessment type</b>	<b>%</b>	<b>Comments</b>
Quiz x4	10	
Practical exercises	45	Patient cases with presentation
End of course exam	45	Theory + Patient cases (1 KAFO + 1 TF) /OSCE exam

#### **RECOMMENDED TEXT BOOKS:**

1. *ICRC Physical Rehabilitation Programme, Lower Limb Orthotics – KAFO, HKAFO and HO - (OTVETC) ICRC*
2. *ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Knee Ankle Foot Orthotics* <https://www.icrc.org/eng/assets/files/other/eng-kafo.pdf>
3. *Hip Disarticulation Prosthetics Course Work Manual – ICRC/CSPO*
4. *ICRC Physical Rehabilitation Programme Manufacturing Guidelines – Hip Disarticulation Prosthetics.*
5. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
6. *Atlas of Amputations and Limb Deficiencies* by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
7. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier

#### **WORKSHOP TECHNOLOGY**

##### **FITTING TOOLS :**

- Introduction
- Holding Tools.
- Marking and measuring tools.
- Cutting tools
- Finishing tools.
- Miscellaneous tools.



- Safe practice with tools.

### **CARPENTRY (WOOD WORKING TOOLS)**

- Introduction.
- Timber.
- Marking and measuring tools.
- Holding Tools.
- Planning
- Cutting.
- Drilling and boring tools.
- Miscellaneous tools.
- Wood joints.
- Safe practice.

### **UNIT III:**

#### **CUTTING SNIPS:**

- Snips.
- Tinner Snips.
- Aviation.
- Types of tinner snips.
- Types of aviation snips.

#### **METAL FASTENERS:**

- Screw.
- Bolts.
- Nuts.
- Nails.
- Rivets.
- Buckles.
- Snap buttons.
- Hooks.
- Lacing and zipper.

#### **THREADS:**

- Screw Threads.
- Screwed joints.
- Screw fastenings.
- Forms of screw threads.

#### **RIVETING:**

- Methods of riveting
- Types of riveted joints

### **WORKSHOP SAFETY:**

- Health risks
- Remedial actions

### **References:**

- A test book of workshop technology by **R.S Khurmi and J.K Gupta**
- Workshop technology by **Chapmen I.**
- Materials and processes in manufacturing by **E.P Degarmo.**

### **DRILLING MACHINE:**

- Basics of drilling machine
- Working principle
- Size and specification
- Parts of drilling machine
- Drilling operations
- Type of drilling machines
- Precautions

### **GRINDING MACHINES:**

- Introduction
- Grinding wheels
- Abrasives
- Action of abrasives
- Bonding materials
- Types of grinding machines
- Construction
- Precautions

### **BAND SAW:**

- Basic purpose
- Working of band saw
- Type of band saw
- Parts of band saw
- Precautions

### **BELT SANDER:**

- Construction
- Working

- Types

### **ROUTER MACHINE:**

- Purpose of router machine
- Construction
- Working

### **VACUUM COMPRESSORS**

- Construction
- Working

### **FURNACE:**

- Introduction.
- Components of furnace.
- Types of furnace.

### **References:**

- Introduction to workshop technology by **Chapman.**
- Workshop technology by **R.S Khurmi.**
- Materials and processes in manufacturing by **E.P Degarmo.**

## **ADVANCED PROSTHETICS**

### **SOCKET INTERFACE AND SUSPENSION (theory)**

- The total surface bearing concept
- Suspension sleeves and liners
  - Silicone
  - Polyurethane
  - Gel
  - Vacuum suspension systems
  - Pin lock systems
  - Advantages and disadvantages

## **HIGH-END PROSTHETIC COMPONENTS - THEORY**

- Prosthetic knees
  - Polycentric
  - Hydraulic vs Pneumatic
  - Stabilised knees
  - Micro-processor controlled knees
  - Sports knees
  - Advantages and disadvantages
- Prosthetic feet
  - Energy storing feet
  - Carbon fiber feet
  - Other feet available
  - Advantages and disadvantages
- Other prosthetic components
  - Hip joints
  - Torque absorbers
  - Shock absorbers
  - Water activity limbs
  - Cosmetic finishing (silicone and other finishing options)

## **CASE STUDY USING HIGH-END COMPONENTS - PRACTICAL**

- Static and dynamic alignment using various components (depending on availability)
- Presentation and discussion on the outcome

## **ISCHIAL CONTAINMENT (ICS) THEORY**

- The ICS concept
- ICS biomechanics
- Indications/contra-indications
- Cast & measures (demonstration)
- Rectification and manufacturing (demonstration)
- Check socket fitting (demonstration)

## **ISCHIAL CONTAINMENT (ICS) PRACTICAL**

- Patient assessment
- Cast & measures
- Rectification and manufacturing
- Check socket fitting
- Definitive socket fitting and alignment
- Dynamic alignment

## **MYOELECTRIC UPPER LIMB PROSTHETICS THEORY**

- Myoelectric theory
- Patient assessment (demonstration)
- Cast & measures (demonstration)
- Rectification and manufacturing (demonstration)
- Check socket fitting (demonstration)

## **MYOELECTRIC UPPER LIMB PROSTHETICS PRACTICAL**

- Patient assessment
- Cast & measures
- Rectification and manufacturing
- Check socket fitting

## **PRACTICAL SESSIONS**

- Cast, measures and production of an ICS to check-socket fitting stage
- Case study using high-end knee or foot (depending on availability)
- Cast, measures and production of an myoelectric upper limb prosthesis (ULP) check socket to fitting stage

## **RECOMMENDED TEXT BOOKS:**

1. *Upper Limb Prosthetics Technical Manual* by Mark Broomfield ICRC/University of Strathclyde
2. *ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Trans-radial prosthetics* <https://www.icrc.org/eng/assets/files/other/eng-trans-radial.pdf>
3. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
4. *Atlas of Amputations and Limb Deficiencies* by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
5. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier
6. *Lower Limb prosthetic Components, Design, Function and Biomechanical Properties* by G. Fitzlaff, S. Heim, Verlag Orthopaedic Technik, 2002, 131P, Dortmund.
7. *Prosthetics and Orthotics: Lower Limb and Spinal* by Ron Seymour; Publisher Lippincott Williams and Wilkins, Edition 1, 2002.

## FIFTH SEMSTER

COURSE CODE	SUBJECTS	CREDIT HOURS
RSC 641	PATHOLOGY & MICROBIOLOGY I	2(2+0)
RSC 662	SURGERY I	3(3-0)
PO 642	CLINICAL ORTHOPAEDICS	2(1+1)
PO 643	WORKSHOP MANAGEMENT	3(3+0)
PO 645	APPLIED PROSTHETICS & ORTHOTICS V	4(1+3)
PO 646	CLINICAL STUDIES	3(2-1)
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# **SURGERY I**

## **Course Description:**

This course intends to familiarize students with principles orthopaedic surgery along with familiarization with terminology and abbreviations for efficient and effective chart reviewing and documentation. It also explores various orthopaedic conditions needing surgical attention, focusing on epidemiology, pathology, as well as primary and secondary clinical characteristics and their surgical management. The purpose of this course is to make physiotherapy students aware of various surgical conditions so these can be physically managed effectively both pre as well as postoperatively.

## **ORTHOPEDIC SURGERY**

### **Fractures**

- Definition
- Classification
- Causes
- Clinical features
- Healing of fractures
- Complications
- Principles of general management of:
  - Fracture of the Upper Extremity
  - Fracture of the Lower Extremity
  - Fracture of the vertebral column, thorax and pelvis
- Basic and advanced trauma life support

### **Dislocations & Subluxations**

- Definition
- Traumatic dislocation
- General description
- Principles of general description and management of traumatic dislocation and subluxation of :
  - Shoulder joint
  - Acromioclavicular joint
  - Elbow joint
  - Hip joint
  - Knee joint

### **Soft Tissue Injuries**

- Introduction
- Anatomy & physiology general description and management of injuries of:
  - Ligaments
  - Tendons
  - Muscles
  - Fascia
  - Bursae
- Detailed description of physiotherapy management of individual tissue injuries around:
  - Shoulder region
  - Elbow region
  - Wrist and hand region
  - Knee region
  - Ankle region
- Muscles and tendons injuries of upper and lower limb
- Cervicolumbar injuries
- Whiplash of the cervical spine
- Crush injuries
- Spinal pain
- Degenerative and Inflammatory Conditions:
  - Osteo-arthrosis/Arthritis
  - Spondylosis
  - Spondylolysis
  - Pyogenic arthritis
  - Rheumatoid arthritis
  - Juvenile arthritis
  - Tuberculosis arthritis
  - Gouty arthritis
  - Haemophilic arthritis
  - Neuropathic arthritis



- Ankylosing spondylitis
- psoriatic arthritis

### **General Orthopedic Disorders**

- Carpel tunnel syndrome
- Compartment syndromes
- Muscular dystrophies
- Neuropathies
- Avascular necrosis of bone in adult and children
- Ischemic contracture
- Gangrene
- Rickets
- Osteoporosis and osteomalacia
- Shoulder pain
- Neck pain
- Knee pain
- Backache
- Painful conditions around elbow
- Detailed description of :
  - Orthotics
  - Prosthetics
  - Splintage
  - Traction
  - POP

### **Tumors**

- Classification
- Principles of general management
- General description of benign and malignant tumors of musculoskeletal system

### **Deformities and Anomalies**

- Definition
- Causes
- Classification

- Congenital and acquired deformities
- Physical and clinical and radiological features
- Complications
- Principles of medical and surgical management of the deformities
- General description of following deformities:

#### Deformities of the spine:

- Torticollis
- Scoliosis
- Kyphosis
- Lordosis
- flat back

#### Deformities of the Lower Limb:

- CDH
- coxa vera
- coxa valga
- anteversion
- Retroversion
- Genu valgum
- Genu varum
- Genu recurvatum
- CDK
- Talipes calcaneus equinus, varus & valgus
- Talipes calcaneovarus
- Talipes calcaneovalgus
- Talipes equinovarus
- Pes cavus

- Pes planus
- Hallux valgus & varum,
- Hallux rigidus and hammer toe

#### Deformities of Shoulder and Upper limb:

- Sprengels shoulder
- Cubitus varum
- Cubitus valgum
- Deputryn's contracture

#### RECOMMENDED TEXT BOOKS

- Short practice of surgery by Baily and Love's
- Text Book of Surgery by Ijaz Ahsan
- Out line of Fractures

## CLINICAL ORTHOPAEDICS

### ORTHOPAEDIC CONDITIONS

- Amputation and disarticulation
  - Common causes of amputation
  - Amputation techniques
  - Amputation sites
  - Post-surgery care
  - Stump and skin problems
  - Phantom pain and sensation
  - Follow-up
- Common foot deformities
- The diabetic foot
- Neuromuscular conditions:
  - Spinal cord injury
  - Cerebral palsy
  - Multiple sclerosis (MS)
  - Stroke (CVA)
  - Nerve injury
  - Spina bifida and hydrocephalus
- Degenerative disorders

- Osteoarthritis
- Rheumatoid arthritis
- Osteoporosis
- Fractures
  - Categories of fracture
  - Fractures by location
  - Complications
  - Fracture healing
  - Fracture management
- Tendon, ligament, and joint injuries and pathologies
- Infectious Conditions
  - TB
  - Polio
  - Bone infection (osteomyelitis, etc.)
  - Gangrene
- Congenital/Hereditary Conditions
  - Clubfoot (CTEV)
  - Muscular dystrophy (MD)
  - Scoliosis
  - Congenital Dislocated Hip (CDH)
- Metabolic Conditions
  - Diabetes
  - Rickets
  - Perthes
- Tumor
- Conditions of Vertebral Column
  - Low back pain/herniated disc
  - Scoliosis
  - Kyphosis
  - Ankylosing Spondylitis
  - Spondylosis
  - Spondylolysis
  - Spinal fractures
  - Whiplash and cervical injury

## **PRACTICAL SESSIONS**

### **FRACTURE BRACE - Demonstration**

- Static and dynamic assessment of the HD amputee

- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- HD prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **FRACTURE BRACE - Practical**

- Static and dynamic assessment of the HD amputee
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- HD prosthesis manufacture to first fitting stage
- Bench alignment
- Static alignment
- Dynamic alignment
- Cosmetic finishing
- Check-out, delivery and follow-up

### **CLINICAL VISITS**

- Visit to clubfoot, diabetic or spinal injuries unit

### **RECOMMENDED TEXT BOOKS:**

1. *Therapy for Amputees* by Barbara Engstorm and Catherine Van de Ven, Churchill (3<sup>rd</sup> Edition)
2. *FO Lower Limb Orthotics* by the ICRC Physical Rehabilitation Programme (OTVETC)
3. *AFO Lower Limb Orthotics* by the ICRC Physical Rehabilitation Programme (OTVETC)
4. *KAFO Lower Limb Orthotics* by the ICRC Physical Rehabilitation Programme (OTVETC)
5. *Trans-tibial Prosthetics – Coursework Manual* by ICRC/CSPO (Tome 1 and 2)
6. *Trans-femoral Prosthetics - Coursework Manual* by ICRC/CSPO (Tome 1 and 2)
7. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition

8. *Atlas of Amputations and Limb Deficiencies* by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
9. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier
10. *Robbins Basic Pathology* by Kumar, Abbas and Aster. Saunders 9<sup>th</sup> Edition
11. *Pathophysiology* by Lee-Ellen C. Copstead and Jacquelyn L. Banasik. Saunders 5<sup>th</sup> Edition

## **WORKSHOP/CENTRE MANAGEMENT**

### **CONTENT:**

#### **INTRODUCTION TO WORKSHOP/CENTRE MANAGEMENT**

- What is management?
- The function of management

#### **WORKSHOP ORGANISATION**

- Workshop Layout
- Workshop processes
- Workflow
- Scheduling
- Efficiency and optimization

#### **QUALITY**

- Quality Control Systems
- Quality Assurance Systems
- International quality standards (Incl. ISO and ISPO)

#### **STORE MANAGEMENT**

- Store organization
- Inventory, stock and their control/management systems
- Procurement/requisition
- Ordering, receiving and issuing stock
- The stocktake

#### **ORGANISATIONAL MANAGEMENT**

- Organisational structure
- Management tools to improve services
- Planning, baseline studies, objectives, outcome measures and SMART goals.
- HR Management
  - Recruitment/appointment
  - Interviews
  - Job descriptions/contract
  - Appraisals
  - Capacity building

- Conflict resolution
- Work ethics

### **BUSINESS MANAGEMENT**

- Accounting Processes
- Cost calculation including:
  - Material
  - Labour
  - Overheads
  - Standard depreciation
  - Prime cost
  - Selling price
  - Profit
- Budgeting
- Quotation, Invoice and receipts, statement of accounts
- Project planning, preparation and implementation
- Data protection, copyright and privacy law
- Funding
- Legalities
- Monitoring and evaluation
- Marketing

### **CLINICAL MANAGEMENT**

- Patient referral protocols – determining when a patient should be referred to a qualified service provider before beginning P&O treatment
- Prioritising patients, waiting lists and triage
- The patient appointment system
- Discharge and follow-up protocols
- The patient record system

### **RECOMMENDED TEXT BOOKS:**

1. *Management* by Danny Samson, Richard L. Draft
2. *New Management* by Prf. Mohammad Amin Khalid

## **APPLIED PROSTHETICS AND ORTHOTICS - V**

### **CONTENT:**

#### **CERVICAL ORTHOTICS - Theory**

- Revision of internal and surface anatomy
- Revision of the biomechanics concerning the cervical spine
- Common pathologies requiring a cervical orthosis
- Reading and using x-rays

- Materials and types including:
  - Soft and hard collars
  - Philadelphia
  - Miami
  - SOMI
  - Minerva
  - Halo
- Device fitting
- Check-out, delivery and follow-up

### **CUSTOM CERVICAL ORTHOTICS (Philadelphia Collar) - Demonstration**

- **Patient assessment**
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- Device manufacture
- Fitting and adjustment
- Finishing
- Check-out, delivery and follow-up

### **CUSTOM CERVICAL ORTHOTICS (Philadelphia Collar) – Practical**

- Patient assessment
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- Device manufacture
- Fitting and adjustment
- Finishing
- Check-out, delivery and follow-up

### **SPINAL ORTHOTICS - Theory**

- Revision of internal and surface anatomy
- Revision of the biomechanics concerning the spine
- Common pathologies requiring a stabilizing and corrective spinal orthosis
- Reading and using x-rays
- Materials and components
- Device design
- Check-out, delivery and follow-up

### **SPINAL ORTHOTICS - Demonstration**

- Patient assessment
- Formulation of functional loss
- Device design
- Casting and measurements



- Rectification of the positive model
- Stabilising spinal orthotic manufacture
- Fitting and adjustment
- Finishing
- Check-out, delivery and follow-up

### **SPINAL ORTHOTICS – Practical**

- **Patient assessment**
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- Stabilising and spinal orthotic manufacture
- Fitting and adjustment
- Finishing
- Check-out, delivery and follow-up

### **RECOMMENDED TEXT BOOKS:**

1. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
2. *Atlas of Amputations and Limb Deficiencies* by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
3. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier
4. *Prosthetics and Orthotics: Lower Limb and Spinal* by Ron Seymour; Publisher Lippincott Williams and Wilkins, Edition 1, 2002.
5. *Atlas of Spinal Orthotics* by Fisk, Lonstein and Malas, Exceed. <http://www.exceed-worldwide.org/atlas-of-spinal-orthotics>

## SIXTH SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
RSC 651	PATHOLOGY & MICROBIOLOGY II	2(2-0)
PO 651	EVIDENCE BASED PRACTICE	3(2-1)
RSC 665	BIOSTATISTICS I	3(3-0)
RSC 663	RADIOLOGY & DIAGNOSTIC IMAGING	3(2-1)
RSC 672	SURGERY II	3(3-0)
PO 652	APPLIED PROSTHETICS & ORTHOTICS VI	4(1+3)
		<b>18</b>



## **PATHOLOGY & MICROBIOLOGY II**

### **Course Description:**

Students will develop an understanding of pathology underlying clinical disease states and involving the major organ systems. Epidemiological issues will be presented and discussed. Students will learn to recognize pathology signs and symptoms that are considered “red flags” for serious disease. Students will use problem-solving skills and information about pathology to decide when referral to another health care provider or alternative intervention is indicated. Students will be expected to develop the ability to disseminate pertinent information and findings, and ascertain the appropriate steps to follow.

### **The Integumentary System**

- Skin Lesions
- Signs and Symptoms of Skin Disease
- Aging and the Integumentary System
- Common Skin Disorders
- Skin Infections
- Skin Cancer
- Skin Disorders Associated With Immune Dysfunction
- Thermal Injuries
- Miscellaneous Integumentary Disorders

### **The Cardiovascular System**

- Signs and Symptoms of Cardiovascular Disease
- Aging and the Cardiovascular System
- Gender Differences and the Cardiovascular System
- Diseases Affecting the Heart Muscle
- Disease Affecting the Cardiac Nervous System
- Diseases Affecting the Heart Valves
- Diseases Affecting the Pericardium
- Diseases Affecting the Blood Vessels
- Other Cardiac Considerations

### **The Lymphatic System**

- Anatomy and Physiology
- Inflammation and Infection in the Lymphatic System

## **The Respiratory System**

- Aging and the Pulmonary System
- Infectious and Inflammatory Diseases
- Obstructive Diseases
- Environmental and Occupational Diseases
- Near Drowning
- Congenital Disorders
- Parenchymal Disorders
- Disorders of the Pulmonary Vasculature
- Disorders of the Pleural Space

## **Pathology of the musculoskeletal System**

### ***Introduction to Pathology of the Musculoskeletal System***

- Advances in Musculoskeletal Biotechnology
- Biologic Response to Trauma
- Aging and the Musculoskeletal System
- The Musculoskeletal System and Exercise
- Musculoskeletal System Disease

### ***Genetic and Developmental Disorders***

- Down syndrome
- Scoliosis
- Kyphoscoliosis
- Spina Bifida Occulta, Meningocele, Myelomeningocele
- Developmental Dysplasia of the Hip
- Neuromuscular Disorders
- Torticollis
- Erb's Palsy
- Osteogenesis Imperfecta
- Arthrogyposis Multiplex Congenita

### ***Metabolic Disorders***

- Osteoporosis
- Osteomalacia
- Paget's Disease

### ***Infectious Diseases of the Musculoskeletal System***

- Osteomyelitis
- Infections of Prostheses and Implants
- Diskitis
- Infectious (Septic) Arthritis
- Infectious (Inflammatory) Muscle Disease

- Extra pulmonary tuberculosis
- Summary of Special Implications for the Therapist

### ***Musculoskeletal Neoplasms***

- Primary Tumors
- Primary Benign Bone tumors
- Primary Malignant Bone tumors
- Multiple Myeloma
- Primary Soft Tissue Tumors
- Metastatic Tumors

### ***Soft Tissue , Joint , and Bone Disorders***

- Soft Tissue
- Joint
- Bone

## **Pathology Of The Nervous System**

### ***Introduction to Central Nervous System Disorders***

- Overview
- Pathogenesis
- Clinical Manifestations
- Diagnosis
- Treatment
- Prognosis

### ***Infectious Disorders of the Central Nervous System***

- Overview
- Meningitis
- Encephalitis
- Brain Abscess
- Prion Disease

### ***Central Nervous System Neoplasms***

- Primary Brain Tumors
- Specific Primary Brain Tumors
- Primary Intraspinal Tumors
- Metastatic Tumors
- Paraneoplastic Syndromes
- Leptomeningeal Carcinomatosis
- Pediatric Tumors

### ***Degenerative Diseases of the Central Nervous System***

- Amyotrophic Lateral Sclerosis,
- Alzheimer's Disease, Alzheimer's Dementia, and Variants
- Dystonia,

- Huntington's Disease
- Multiple Sclerosis
- Parkinsonism and Parkinson's Disease

### **Stroke**

- Stroke
- Vascular Disorders of the Spinal Cord

### **Medical Microbiology**

#### **1) G +ve cocci**

- a. Staphylococci
- b. Streptococci

#### **2) G -ve cocci**

- a. Neisseria

#### **3) G +ve spore forming rods**

- a. Bacillia
- b. Clostridia
- c. G -ve rods (introduction to Enterics)

#### **4) Acid fast bacilli**

- a. Mycobacteria

#### **5) Spirochetes**

- a. Introduction
- b. Treponemes

#### **6) Basic virology**

- a. General characteristics
- b. Viral structure
- c. Nomenclature and classification

#### **7) Mycology**

Introduction to mycology

#### **8) Parasitology**

Introduction to protozoan

### **Practical Training/ Lab Work**

- To study the microscope
- To study the calcification
- To study the osteogenic sarcoma
- To study the granulation tissue
- To study the chronic inflammation (cholecystitis)
- To study the acute inflammation (appendicitis)
- To Fibroadenoma
- To study the carcinoma of breast
- To study the actinomycosis

- To study the culture media
- To study the gram staining
- To study the Z-N staining
- To study the giant cell tumor
- Examination of urine

### **Recommended Text Books**

- *Pathology: implications for the Physical therapist* by: Catherine cavallaro Goodman, 3<sup>rd</sup> edition
- *Basics & advanced Human Pathology*
- *Pathology* by Robbins
- *Introduction to Pathology* by Weight
- *Lecture notes on Pathology* by Thomas and Cotton
- *General Pathology* by Florey *Medical Microbiology and Immunology* By: Levinson and Jawetz, 9th Ed., Mc Graw-Hill.

## **EVIDENCE BASED PRACTICE**

### **Course Description**

This course introduces the concept of evidence-based practice in physical therapy including the formulation of answerable clinical questions, methods of obtaining peer-reviewed evidence to those clinical questions, and how to critically appraise evidence once located. This course is a lecture and seminar course that will focus on developing the skills need for evaluating, critiquing, and consuming the literature germane to physical therapy practice. Current journal articles, texts, and online resources will be used in the course to develop critical reading and writing skills.

### **Evidence-Based Physiotherapy**

- An introduction about evidence-based Physiotherapy:
  - What do we mean by 'high quality clinical research'?
  - What do we mean by 'patient preferences'?
  - What do we mean by 'practice knowledge'?
  - Additional factors
  - The process of clinical decision-making
- Importance of evidence-based Physiotherapy:
  - For patients
  - For physiotherapists and the profession
  - For funders of physiotherapy services

- History of Evidence-Based Health Care
  - Steps for practicing evidence-based Physiotherapy

### What do we need to know?

- Relevant clinical questions
- Refining your question
  - Effects of intervention
  - Experiences
  - Prognosis
  - Diagnosis

### What constitutes evidence?

- Evidence about effects of interventions
- Different forms of evidence
- Different sources of evidence
- Hierarchy of evidence
- Research study design

### Finding the Evidence

- Search Strategies
  - The World Wide Web
  - Selecting search terms AND and OR
  - Finding Evidence of Effects of Interventions
  - PEDro
  - The Cochrane Library
- Finding Evidence of Prognosis and Diagnostic Tests
- Finding Evidence of Experiences
  - CINAHL
  - Pub Med
- Getting full text
- Finding evidence of advances in clinical
- Practice (Browsing)

### Trust upon Evidence

- A process for critical appraisal of evidence
- Critical appraisal of evidence about the Effects of intervention
  - Randomized trials
  - Systematic reviews of randomized trials
- Critical appraisal of evidence about experiences
- Critical appraisal of evidence about prognosis
  - Individual studies of prognosis



- Systematic reviews of prognosis
- Critical Appraisal of Evidence about Diagnostic Tests
  - Individual studies of diagnostic tests
  - Systematic reviews of diagnostic tests

### Clinical Guidelines as a Resource for Evidence-Based Physiotherapy

- What are clinical guidelines?
- History of clinical guidelines and why they are important
- Where can I find clinical guidelines?
- How do I know if I can trust the recommendations in a clinical Guideline?
  - Scope and purpose
  - Stakeholder involvement
  - Rigor of development
  - Clarity and presentation
  - Applicability
  - Editorial independence
  - What do the results of the critical appraisal mean for my practice?
- Legal Implications of Clinical Guidelines
  - Clinical guidelines or 'reasonable care': which do the courts consider more important?
  - Documenting the use of a clinical guideline in practice: legal implications
- Reflections on the Future of Guideline Development
  - Who should develop clinical guidelines?
  - Collaboration in guideline development
  - Uniprofessional or multiprofessional guideline development?

### Critical Thinking

- The Benefit of Asking the Right Questions
- What Are the Issue and the Conclusion?
- What Are the Reasons?
- What Words or Phrases Are Ambiguous?
- What Are the Value Conflicts and Assumptions?
- What Are the Descriptive Assumptions?
- Are There Any Fallacies in the Reasoning?
- How Good Is the Evidence: Intuition, Personal Experience?
- Testimonials, and Appeals to Authority?
- How Good Is the Evidence: Personal Observation, Research?
- Studies, Case Examples, and Analogies
- Are There Rival Causes?
- Are the Statistics Deceptive?
- What Significant Information Is Omitted?

- What Reasonable Conclusions Are Possible?
- Practice and Review
- The Tone of Your Critical Thinking
- Strategies for Effective Critical Thinking

## **PRACTICAL**

- Identify the different sources of evidence
- Critically appraised topics (CAT)
- How to evaluate web page
- Ways of searching strategies for different databases
- Selection of search terminology
- Retrieving of articles from data bases

## **RECOMMENDED TEXT BOOKS**

- Practical Evidence based physiotherapy By, Rob Herbert, Gro Jamtdvedt, Judy Mead& Kare Birger Hagen.
- Asking the right question-A guide to critical thinking, 8th Edition By, M.Neil.Browne& Stuart M Keeley
- Additional reading material as assigned.

## **BIOSTATISTICS I**

### **What is Statistics?**

Definition of Statistics, Population, sample Descriptive and inferential Statistics, Observations, Data, Discrete and continuous variables, Errors of measurement, Significant digits, Rounding of a Number, Collection of primary and secondary data, Sources, Editing of Data. Exercises.

### **Presentation of Data**

Introduction, basic principles of classification and Tabulation, Constructing of a frequency distribution, Relative and Cumulative frequency distribution, Diagrams, Graphs and their Construction, Bar charts, Pie chart, Histogram, Frequency polygon and Frequency curve, Cumulative Frequency Polygon or Ogive, Histogram, Ogive for Discrete Variable. Types of frequency curves. Exercises.

### **Measures of Central Tendency**

Introduction, Different types of Averages, Quantiles, The Mode, Empirical Relation between Mean, Median and mode, Relative Merits and Demerits of various Averages. properties of

Good Average, Box and Whisker Plot, Stem and Leaf Display, definition of outliers and their detection. Exercises.

### **Measures of Dispersion**

Introduction, Absolute and relative measures, Range, The semi-Inter-quartile Range, The Mean Deviation, The Variance and standard deviation, Change of origin and scale, Interpretation of the standard Deviation, Coefficient of variation, Properties of variance and standard Deviation, Standardized variables, Moments and Moments ratios. Exercises.

### **Probability and Probability Distributions.**

Discrete and continuous distributions: Binomial, Poisson and Normal Distribution. Exercises

### **Sampling and Sampling Distributions**

Introduction, sample design and sampling frame, bias, sampling and non sampling errors, sampling with and without replacement, probability and non-probability sampling, Sampling distributions for single mean and proportion, Difference of means and proportions. Exercises.

### **Recommended Books**

- Walpole, R. E. 1982. "Introduction to Statistics", 3<sup>rd</sup> Ed., Macmillan Publishing Co., Inc. New York.
- Muhammad, F. 2005. "Statistical Methods and Data Analysis", Kitab Markaz, Bhawana Bazar Faisalabad.

## **RADIOLOGY & DIAGNOSTIC IMAGING 3(2-1)**

**CREDIT**

### **Course Description:**

This course covers the study of common diagnostic and therapeutic imaging tests. At the end of the course students will be aware of the indications and implications of commonly used diagnostic imaging tests as they pertain to patient's management. The course will cover that how X-Ray, CT, MRI, Ultrasound and Other Medical Images are created and how they help the health professionals to save lives.

### **From the Watching of Shadows:**

- History
- A New Kind of Ray
- How a Medical Image Helps
- What Imaging Studies Reveal
- Radiography( x-rays )

- Fluoroscopy
- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Ultrasound
- Endoscopy

### **Radiography and Mammography:**

- Equipment components
- Procedures for Radiography & Mammography
- Benefits versus Risks and Costs
- Indications and contraindications

### **Fluoroscopy:**

- What is Fluoroscopy?
- Equipment used for fluoroscopy
- Indications and Contra indications
- How it helps in diagnosis
- The Findings in Fluoroscopy
- Benefits versus Risks and Costs

### **Computed Tomography (CT):**

- What is Computed Tomography?
- Equipment used for Computed Tomography
- Indications and Contra indications
- How it helps in diagnosis
- The Findings in Computed Tomography
- Benefits versus Risks and Costs

### **Magnetic Resonance Imaging (MRI)**

- What is MRI?
- Equipment used for MRI
- Indications and Contra indications
- How it helps in diagnosis
- The Findings in MRI
- Benefits versus Risks and Costs
- Functional MRI

### **Ultrasound:**

- What is Ultrasound?
- Equipment used for Ultrasound
- Indications and Contra indications
- How it helps in diagnosis
- The Findings in Ultrasound

- Benefits versus Risks and Costs

### **Endoscopy:**

- What is Endoscopy?
- Equipment used for Endoscopy
- Indications and Contra indications
- How it helps in diagnosis
- The Findings in Endoscopy
- Benefits versus Risks and Costs

### **Nuclear Medicine:**

- What is Nuclear Medicine?
- Equipment used for Nuclear Medicine
- Indications and Contra indications
- How it helps in diagnosis.
- Benefits versus Risks and Costs

### **Interventional Radiology**

#### **Recommended Text Book:**

- Looking Within (How X-ray, CT, MRI, Ultrasound and Other Medical Images Created and How They Help Physicians Save Lives) By Anthony Brinton Wolbarst
- *A-Z of Musculoskeletal and Trauma Radiology* By: James R. D. Murray
- *Essentials of Radiology* by Fred. A. Mettler, 2<sup>nd</sup> edition.

*Imaging in rehabilitation*, By: Terry. R. Malone, Charles Hazle & Michael L. Grey.

McGraw Hill Publishers

## **SURGERY II**

### **Course Description**

This course intends to familiarize students with principles orthopaedic surgery along with familiarization with terminology and abbreviations for efficient and effective chart reviewing and documentation. It also explores various orthopaedic conditions needing surgical attention, focusing on epidemiology, pathology, as well as primary and secondary clinical characteristics and their surgical management. The purpose of this course is to make physiotherapy students aware of various surgical conditions so these can be physically managed effectively both pre as well as postoperatively

### **Detailed Course Outline**

#### **GENERAL SURGERY**

- Introduction

- Indications for surgery
- Types of incisions
- Wounds, types of wounds, factors affecting wounds healing, care of wounds
- Bandages and dressing
- Trauma and metabolic response to trauma
- Detailed description of chest and abdominal trauma
- Hemorrhage, hemostasis and blood transfusion
- Classification and brief description of shock
- Fluid and electrolyte balance
- Classification of body fluid changes
- Pre, intra and post operative fluid therapy
- Surgery and diabetes
- Burns and grafts
- Neoplasia
- Preoperative assessment & preparation
- Post operative treatment, complications and their management
- Types of anaesthesia
  - Local anaesthetic agents
  - Regional anaesthesia (spinal and epidural)
- Intravenous anaesthetic agents
- Muscle relaxants
- Inhalational anaesthetic agents
- Anaesthesia and associated diseases.
- Complications of anaesthesia.
- Perioperative management.
- Cardiopulmonary Resuscitation. CPR.
- Recovery from anaesthesia.
- Pain management and postoperative care.
- Ulcers, sinuses and fistulas
- Transplantation
- Brief description of operation performed on: oesophagus, stomach, intestine gall bladder, bile duct, spleen, pancreas, liver, abdominal wall, hernias, breast, kidneys, ureters, prostate, peritoneum, mesentery and retroperitoneal space

## **THORACIC SURGERY**

### **PULMONARY SURGERY**

- Introduction
- types of incision
- types of operation
- complications of pulmonary surgery
- drains , tubes
- pneumonectomy, lobectomy , thoracoplasty

- Operations on pleura
- Chest injuries
- Brief description of indication for pulmonary surgery:
  - Diseases of chest wall and pleura
  - Diseases of bronchi
  - Tumors of lung
  - Lung abscess
  - Hydatid disease of lung
  - Pulmonary embolism
  - Mediastinal masses
  - Problems related to diaphragm

### **CARDIAC SURGERY**

- Introduction
- Cardiorespiratory resuscitation
- Special investigation procedures in cardiac surgery
- Basic techniques in cardiac surgery
- Types of incision
- Types of operation
- Complications of cardiac surgery
- Lines, drains and tubes
- Brief description of indications for cardiac surgery :
  - Congenital heart diseases
  - Acquired heart diseases
  - Diseases of the pericardium
  - Cardiac transplantation

### **Vascular surgery**

- Introduction
- Investigation in vascular disease types of operation
- Indication for vascular surgery
- Complication of vascular surgery
- Brief description of arterial occlusion
- Gangrene
- Detailed description of amputation
- Aneurysm
- Burgers disease
- Raynaud's disease and syndrome
- Varicose veins
- Superficial and deep venous thrombosis
- Venous hemorrhage
- Lymph edema

- Lymph adenitis and lymphomas

## **NEUROSURGERY**

### **CRANIAL SURGERY**

- Introduction
- Special investigation in brain diseases and traumas
- Types of operations, indications and complications of cranial surgery
- Head injuries to the brain
- Acute intracranial hematomas
- Fractures of the skull
- Intra cranial abscess
- Intracranial tumors
- Intra cranial aneurysm and hydrocephalus

### **Surgery of vertebral column spinal cord and peripheral nerves**

- Dislocation and management of dislocation of vertebral column
- Tumors of vertebral column
- Prolapse intervertebral disc
- Disc protrusion
- Spondylosis and spondylolisthesis
- Spinal cord injuries and their management
- Tumors of spinal cord types of operations performed on nerves
- Nerve injuries and their surgical management
- Brief description of lesions of cranial and spinal nerves and their management

### **Recommended Text Books**

- Short practice of surgery by Baily and Love's
- Text Book of Surgery by Ijaz Ahsan
- Outline of Fractures by David Hamblen, Hamish Simpsons
- Outline of orthopedics. by David Hamblen, Hamish Simpsons
- Apley's systems of orthopedics and fractures by Louis Solomon 9th ed , publisher holder Arnold

## **APPLIED PROSTHETICS AND ORTHOTICS - VI**

### **UPPER LIMB PROSTHETICS - Theory**



- Revision of internal and surface anatomy of the upper limb
- Situations requiring upper limb prosthetic intervention (Wrist disarticulation, trans-radial, elbow disarticulation, trans-humeral and shoulder disarticulation)
- Revision of the biomechanics of upper limb prosthetics
- Material and components
- Device design
- Check-out, delivery and follow-up

### **UPPER LIMB PROSTHETICS - Demonstration**

- Static and dynamic assessment of the upper limb prosthetic patient
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- Upper limb prosthetic manufacture to first fitting stage
- First fitting
- Finishing
- Check-out, delivery and follow-up

### **UPPER LIMB PROSTHETICS – Practical**

- Static and dynamic assessment the upper limb prosthetic patient
- Formulation of functional loss
- Device design
- Casting and measurements
- Rectification of the positive model
- Upper limb prosthetic manufacture to first fitting stage
- First fitting
- Finishing
- Check-out, delivery and follow-up

### **UPPER LIMB ORTHOTICS - Theory**

- Revision of internal and surface anatomy of the upper limb
- Situations requiring upper limb orthotic intervention
- Fracture braces
- Flail arm braces
- Revision of the biomechanics of upper limb orthotics
- Material and components incl. prefabricated devices
- Device design and corrective forces
- **Check-out, delivery and follow-up**

### **UPPER LIMB ORTHOTICS - Demonstration**

- Static and dynamic assessment of the upper limb orthotic patient
- Formulation of functional loss
- Device design and corrective forces

- Low temperature thermoplastic device design/production
- Casting and measurements
- Rectification of the positive model
- Upper limb orthosis manufacture to first fitting stage
- First fitting
- Finishing
- Check-out, delivery and follow-up

### **UPPER LIMB ORTHOTICS – Practical**

- Static and dynamic assessment the upper limb orthotics patient
- Formulation of functional loss
- Device design and corrective forces
- Casting and measurements
- Rectification of the positive model
- Upper limb orthosis manufacture to first fitting stage
- First fitting
- Finishing
- Check-out, delivery and follow-up

### **RECOMMENDED TEXT BOOKS:**

1. *Upper Limb Prosthetics Technical Manual* by Mark Broomfield ICRC/University of Strathclyde
2. *ICRC Physical Rehabilitation Programme Manufacturing Guidelines - Trans-radial prosthetics* <https://www.icrc.org/eng/assets/files/other/eng-trans-radial.pdf>
3. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
4. *Atlas of Amputations and Limb Deficiencies* by Smith, Michael and Bowker, 3<sup>rd</sup> Edition
5. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier
6. *Prosthetics and Orthotics: Lower Limb and Spinal* by Ron Seymour; Publisher Lippincott Williams and Wilkins, Edition 1, 2002.
7. *Upper Limb Orthotics* by Mark Broomfield, ICRC

## **SEVENTH SEMESTER**

COURSE CODE	SUBJECTS	CREDIT HOURS
PO 661	ORTHOTICS CLINICAL PRACTICE I	3(1-2)
PO 662	PROSTHETICS CLINICAL PRACTICE I	3(1-2)
RSC 674	BIOSTATICS II	3(3-0)
PO 663	FOOT CARE (DIABETIC/NEUROPATHIC FOOT)	3(3+0)
PO 664	ADVANCED ORTHOTICS	3(2+1)
RSC 684	SCIENTIFIC INQUIRY & RESEARCH METHODOLOGY	3(2-1)
		<b>18</b>



## ORTHOTICS CLINICAL PRACTICE- I

### CONTENT:

Under the supervision of an appointed supervisor, the student will complete a clinical case load. This will include assessment, cast and measures, fabrication of the device, static and dynamic fitting, delivery and follow-up. The case load should cover, as much as possible, the full range of orthotic devices.

The student will plan his or her work, make the appointments for the patient, collaborate with the interdisciplinary clinical team and make the necessary reports in the patient file and other required documentation. Above all the student will involve, and keep the patient informed throughout his/her course of treatment.

Throughout the clinical placement the student will maintain a log book recording each case he/she takes on. The student supervisor is responsible for providing feedback in this log book on each critical stage of the treatment process. This will, as well, necessitate the supervisor to verify the student's quality of work, usually by way of the student presenting his case, at assessment, fitting and delivery stages.

### EXPECTED CLINICAL PLACEMENT PRODUCTION

<b>Device Type</b>	<b>Recommended no. required</b>
Foot orthosis (soft)	2
Foot orthosis (rigid)	2
Supra malleoli/UBCL	1
Ankle foot orthosis (rigid)	2
Ankle foot orthosis (jointed)	2
Ankle foot orthosis (dynamic)	2
Knee ankle foot orthosis (rigid)	1
Knee ankle foot orthosis (jointed)	4
Hip knee ankle foot orthosis	1*
Hip orthosis	1*
Spinal orthosis (lumbar sacral)	1*
Spinal orthosis (Boston)	1*
Spinal orthosis (Cheneau)	1*
Spinal orthosis (rigid)	1*

Cervical orthosis (soft or rigid)	1
Finger orthosis	2
Wrist hand orthosis (rigid)	2
Wrist hand orthosis (dynamic)	1*
Fracture brace (trans-tibial)	1*
Fracture brace (trans-femoral)	1*
Fracture brace (trans-radial)	1*
Fracture brace (trans-humeral)	1*
<b>Total</b>	<b>32</b>

\*Optional (depending on patient availability) or 2-3 students can be allowed to attend to a single patient

#### RECOMMENDED BOOKS

Nil

#### PROSTHETICS CLINICAL PRACTICE- I

#### CONTENT:

Under the supervision of an appointed supervisor, the student will complete a clinical case load. This will include assessment, cast and measures, fabrication of the device, static and dynamic fitting, delivery and follow-up. The case load should cover, as much as possible, the full range of prosthetic devices.

The student will plan his or her work, make the appointments for the patient, collaborate with the interdisciplinary clinical team and make the necessary reports in the patient file and other required documentation. Above all the student will involve, and keep the patient informed throughout his/her course of treatment.

Throughout the clinical placement the student will maintain a log book recording each case he/she takes on. The student supervisor is responsible for providing feedback in this log book on each critical stage of the treatment process. This will, as well, necessitate the supervisor to verify the student's quality of work, usually by way of the student presenting his case, at assessment, fitting and delivery stages.

### EXPECTED CLINICAL PLACEMENT PRODUCTION

Device Type	Recommended no. required
Partial Foot	2
Ankle disarticulation	3
Trans-tibial	5
Knee disarticulation	1*
Trans-femoral	5
Hip disarticulation	1*
Partial hand	1*
Wrist disarticulation	1*
Trans-radial	1*
Elbow disarticulation	1*
Trans-humeral	1*
Shoulder disarticulation	1*
<b>Total</b>	<b>23</b>

\*Optional (depending on patient availability) or 2-3 students can be allowed to attend to a single patient

Also, if the opportunity arises, additional devices (not listed) can be produced by the student e.g.:

- Trans-tibial total surface bearing (TSB) with silicone liner
- Trans-femoral with ischial containment socket (ICS)
- Silicone partial foot
- Trans-femoral with high-end modular knee joint

### RECOMMENDED BOOKS

Nil

### BIOSTATICS II

## **HYPOTHESIS TESTING**

Introduction, Statistical problem, null and alternative hypothesis, Type-I and Type-II errors, level of significance, Test statistics, acceptance and rejection regions, general procedure for testing of hypothesis. Exercises.

### **TESTING OF HYPOTHESIS- SINGLE POPULATION**

Introduction, testing of hypothesis and confidence interval about the population mean and proportion for small and large samples, Exercises

### **TESTING OF HYPOTHESES-TWO OR MORE POPULATIONS**

Introduction, Testing of hypothesis and confidence intervals about the difference of population means and proportions for small and large samples, Analysis of Variance and ANOVA Table. Exercises

### **TESTING OF HYPOTHESIS-INDEPENDENCE OF ATTRIBUTES**

Introduction, Contingency Tables, Testing of hypothesis about the Independence of attributes. Exercises.

### **REGRESSION AND CORRELATION**

Introduction, cause and effect relationships, examples, simple linear regression, estimation of parameters and their interpretation.  $r$  and  $R^2$ . Correlation. Coefficient of linear correlation, its estimation and interpretation. Multiple regression and interpretation of its parameters. Examples

# **FOOT CARE (DIABETIC/NEUROPATHIC FOOT)**

**(ELECTIVE 1)**

**CREDIT HOURS 3(3+0)**

## **COURSE DESCRIPTION:**

Due to development and inevitable life-style changes, diabetes is a rapidly growing problem around the world. Diabetes can be an extremely debilitating condition, often leading to multiple amputations, however, if managed well and early enough, disability can be avoided. One of the key components of this treatment is foot care.

In this very important course, students will gain greater back ground knowledge on diabetes and similar conditions that lead to a neuropathic foot. They will learn what advice to give patients regarding where to get specialist medical help for their condition and how they can help themselves through their personal foot care.

In cases where the foot is already showing signs of damage or it at risk, students will learn what kind of orthotic intervention is indicated, the biomechanical factors to consider, and the necessary follow-up. If a patient has a partial amputation, foot care can prevent further amputations and increased disability.

## **LEARNING OBJECTIVES:**

By the end of the course the students will be able to:

- Describe the major pathogenesis and clinical presentation of diabetes, particularly regarding how the foot can be effected
- Demonstrate a thorough assessment of the patient's
- Give a list of possible intervention, stating the rationale and evidence behind these suggestions
- Demonstrate proper additional support to the patient such as advising him/her on follow-up care of his/her condition from other specialists
- Explain the role of the physical rehabilitation team in the management of a diabetic/neuropathic foot and how interdisciplinary working can significantly improve the outcome

## **CONTENT:**

### **DIABETES**



- Types of diabetes
  - Type I
  - Type II
- Pathogenesis
  - Neuropathy
  - Ulcers
  - Gangrene
  - Painful diabetic neuropathy
- Organ involvement
  - Eyes
  - Kidneys
  - Nerves
- Foot deformities
- Life-style modification

### **OTHER CONDITIONS PUTTING THE FOOT AT RISK**

- Peripheral vascular disease (PVD)
- Nerve injury
- Metabolic syndrome
- Hypertension
- Hyper-cholesterol
- Charcot foot

### **BIOMECHANICS OF THE FOOT**

- Arches of the foot
- Windlass mechanism
- Closed and open chain characteristics of the foot and ankle
- Partial foot amputations/disarticulation and the biomechanical impact
- Biomechanical effect of foot deformities
- Biomechanical risk factors of pressure, friction, shear, and pressure relief

## **PATIENT AND FOOT ASSESSMENT**

- Patient history taking
- Recognition and classification of ulceration
- Identification of vascular insufficiency
- Neurological deficit
- Foot and toe deformities

## **TREATMENT**

- Orthopaedic footwear and shoe modifications
- Insoles
- Materials
- Post-operative orthosis
- Wound healing casts
- Patient self-care
- Cognitive behavior therapy
- Follow-up

## **INTERDISCIPLINARY TEAM**

- Podiatry
- Radiology
- Wound care
- Obesity and diet management

## **PRACTICAL SESSIONS**

- Case studies
- Diabetic clinic visit

## **METHODS OF ASSESSMENT:**

<b>Assessment type</b>	<b>%</b>	<b>Comments</b>
Quiz x4	10	
Practical exercises	45	Patient cases with presentation
End of course exam	45	Theory

## **RECOMMENDED TEXT BOOKS:**

1. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
2. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier

3. *Prosthetics and Orthotics: Lower Limb and Spinal* by Ron Seymour; Publisher Lippincott Williams and Wilkins, Edition 1, 2002.
4. *Atlas of Spinal Orthotics* by Fisk, Lonstein and Malas, Exceed.  
<http://www.exceed-worldwide.org/atlas-of-spinal-orthotics>

## **CONTENT:**

### **FUNCTIONAL ELECTRICAL STIMULATION (FES)**

- FES theory
- Indications for FES
- Case studies (video demonstrations)
- Patient demonstration (if available)

### **DYNAMIC ANKLE FOOT ORTHOTICS (DAFO) THEORY & DEMO**

- Revision of the nervous system and spasticity
- The DAFO concept
- Indication and contra-indication of DAFOs
- Dynamic sole plate (demonstration)
- Cast and measures (demonstration)
- Rectification and manufacturing (demonstration)
- Fitting and tuning (demonstration)

### **DYNAMIC ANKLE FOOT ORTHOTICS (DAFO) PRACTICE**

- Patient assessment
- The DAFO concept
- Dynamic sole plate production
- Cast and measures
- Rectification and manufacturing
- Fitting and tuning (dynamic alignment)

### **CORRECTIVE SPINAL ORTHOTICS THEORY & DEMO**

- Scoliosis and Kyphosis
- Intervention criteria
- X-ray reading and Cobb angle measurement (demonstration)
- Patient assessment
- Positioning of corrective forces (demonstration)
- Casting and Rectification (demonstration)
- Fitting (demonstration)

- Delivery
- Follow-up

### **CORRECTIVE SPINAL ORTHOTICS PRACTICAL**

- Patient assessment
- Intervention criteria
- X-ray reading and Cobb angle measurement
- Positioning of corrective forces
- Casting and Rectification
- Fitting and adjustment
- Delivery
- Follow-up

### **RECIPROCAL GAIT ORTHOSIS (RGO)**

- RGO Theory
- Assessment and measurement and casting (demonstration if available)
- Manufacture (demonstration if available)
- Fitting (demonstration if available)

### **PRACTICAL SESSIONS**

- FES observations in the clinical
- Assess, cast, measures, production and fitting for a DAFO
- Assess, cast, measures, production and fitting of corrective spinal orthosis (SO)
- Measures and selection of an RGO (if available)

### **RECOMMENDED TEXT BOOKS:**

5. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
6. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier
7. *Prosthetics and Orthotics: Lower Limb and Spinal* by Ron Seymour; Publisher Lippincott Williams and Wilkins, Edition 1, 2002.
8. *Dynamic Orthotic Concepts: Background and experiences* by Nancy Hilton, Verlag Orthopaedic-Technik, Dortmund, 2000.
9. *Atlas of Spinal Orthotics* by Fisk, Lonstein and Malas, Exceed.  
<http://www.exceed-worldwide.org/atlas-of-spinal-orthotics>

## **ADVANCED ORTHOTICS**

## **CONTENT:**

### **FUNCTIONAL ELECTRICAL STIMULATION (FES)**

- FES theory
- Indications for FES
- Case studies (video demonstrations)
- Patient demonstration (if available)

### **DYNAMIC ANKLE FOOT ORTHOTICS (DAFO) THEORY & DEMO**

- Revision of the nervous system and spasticity
- The DAFO concept
- Indication and contra-indication of DAFOs
- Dynamic sole plate (demonstration)
- Cast and measures (demonstration)
- Rectification and manufacturing (demonstration)
- Fitting and tuning (demonstration)

### **DYNAMIC ANKLE FOOT ORTHOTICS (DAFO) PRACTICE**

- Patient assessment
- The DAFO concept
- Dynamic sole plate production
- Cast and measures
- Rectification and manufacturing
- Fitting and tuning (dynamic alignment)

### **CORRECTIVE SPINAL ORTHOTICS THEORY & DEMO**

- Scoliosis and Kyphosis
- Intervention criteria
- X-ray reading and Cobb angle measurement (demonstration)
- Patient assessment
- Positioning of corrective forces (demonstration)
- Casting and Rectification (demonstration)
- Fitting (demonstration)
- Delivery
- Follow-up

### **CORRECTIVE SPINAL ORTHOTICS PRACTICAL**

- Patient assessment
- Intervention criteria
- X-ray reading and Cobb angle measurement
- Positioning of corrective forces
- Casting and Rectification

- Fitting and adjustment
- Delivery
- Follow-up

### **RECIPROCAL GAIT ORTHOSIS (RGO)**

- RGO Theory
- Assessment and measurement and casting (demonstration if available)
- Manufacture (demonstration if available)
- Fitting (demonstration if available)

### **PRACTICAL SESSIONS**

- FES observations in the clinical
- Assess, cast, measures, production and fitting for a DAFO
- Assess, cast, measures, production and fitting of corrective spinal orthosis (SO)
- Measures and selection of an RGO (if available)

### **RECOMMENDED TEXT BOOKS:**

10. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
11. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier
12. *Prosthetics and Orthotics: Lower Limb and Spinal* by Ron Seymour; Publisher Lippincott Williams and Wilkins, Edition 1, 2002.
13. *Dynamic Orthotic Concepts: Background and experiences* by Nancy Hilton, Verlag Orthopaedic-Technik, Dortmund, 2000.
14. *Atlas of Spinal Orthotics* by Fisk, Lonstein and Malas, Exceed.  
<http://www.exceed-worldwide.org/atlas-of-spinal-orthotics>

## **SCIENTIFIC INQUIRY & RESEARCH METHODOLOGY**

### **Course Description:**

This course includes discussion on basic quantitative methods and designs, including concepts of reliability and validity, interpretation of inferential statistics related to research designs, co relational statistic & designs, interclass correlation coefficients, and critical appraisal of the literature.

## **Research Fundamentals**

- Rehabilitation Research
- Theory in Rehabilitation Research
- Research Ethics

## **Research Design**

- Research Problems, Questions, and Hypotheses
- Research Paradigms
- Design Overview
- Research Validity

## **Experimental Designs**

- Group Designs
- Single-System Design

## **NON EXPERIMENTAL RESEARCH**

- Overview of Non experimental Research
- Clinical Case Reports
- Qualitative Research
- Epidemiology
- Outcomes Research
- Survey Research

## **MEASUREMENT**

- Measurement Theory
- Methodological Research

## **DATA ANALYSIS**

- Statistical Reasoning
- Statistical Analysis of Differences; The basics
- Statistical Analysis of Differences; Advanced and special Techniques
- Statistical Analysis of Relationships; The basics
- Statistical Analysis of Relationships; Advanced and special Techniques

## **BEING A CONSUMER**

- Locating the Literature
- Evaluating Evidence One Article at a time
- Synthesizing Bodies of Evidence

## **IMPLEMENTING RESEARCH**

- Implementing a Research Project
- Publishing and Presenting Research

### **PRACTICAL**

- Literature review
- Preparation, presentation and defence of research proposal
- Poster presentation

### **RECOMMENDED TEXTBOOK**

- Essentials of clinical research By Stephan P. Glasser
- Rehabilitation Research (Principles and Applications) 3<sup>rd</sup> Edition By Elizabeth Domholdt
- Walpole, R. E. 1982. "Introduction to Statistics", 3rd Ed., Macmillan Publishing Co., Inc. New York. Muhammad, F. 2005.
- "Statistical Methods and Data Analysis", Kitab Markaz, Bhawana Bazar Faisalabad







## EIGHT SEMESTER

COURSE CODE	SUBJECTS	CREDIT HOURS
PO 671	ORTHOTICS CLINICAL PRACTICE II	4(1+3)
PO 672	PROSTHETICS CLINICAL PRACTICE II	4(1+3)
PO 673	RESEARCH PROJECT	6(6+0)
PO 674	MOTION ANALYSIS	3(3+0)
		<b>17</b>



## ORTHOTICS CLINICAL PRACTICE- II

### CONTENT:

Under the supervision of an appointed supervisor, the student will complete a clinical case load. This will include assessment, cast and measures, fabrication of the device, static and dynamic fitting, delivery and follow-up. The case load should cover, as much as possible, the full range of orthotic devices.

The student will plan his or her work, make the appointments for the patient, collaborate with the interdisciplinary clinical team and make the necessary reports in the patient file and other required documentation. Above all the student will involve, and keep the patient informed throughout his/her course of treatment.

Throughout the clinical placement the student will maintain a log book recording each case he/she takes on. The student supervisor is responsible for providing feedback in this log book on each critical stage of the treatment process. This will, as well, necessitate the supervisor to verify the student's quality of work, usually by way of the student presenting his case, at assessment, fitting and delivery stages.

### EXPECTED CLINICAL PLACEMENT PRODUCTION

Device Type	Recommended no. required
Foot orthosis (soft)	2
Foot orthosis (rigid)	2
Supra malleoli/UBCL	1
Ankle foot orthosis (rigid)	2
Ankle foot orthosis (jointed)	2
Ankle foot orthosis (dynamic)	2
Knee ankle foot orthosis (rigid)	1
Knee ankle foot orthosis (jointed)	4
Hip knee ankle foot orthosis	1*
Hip orthosis	1*
Spinal orthosis (lumbar sacral)	1*
Spinal orthosis (Boston)	1*
Spinal orthosis (Cheneau)	1*
Spinal orthosis (rigid)	1*

Cervical orthosis (soft or rigid)	1
Finger orthosis	2
Wrist hand orthosis (rigid)	2
Wrist hand orthosis (dynamic)	1*
Fracture brace (trans-tibial)	1*
Fracture brace (trans-femoral)	1*
Fracture brace (trans-radial)	1*
Fracture brace (trans-humeral)	1*
<b>Total</b>	<b>32</b>

\*Optional (depending on patient availability) or 2-3 students can be allowed to attend to a single patient

### RECOMMENDED BOOKS

Nil

### PROSTHETICS CLINICAL PRACTICE- II CREDIT HOURS 4(1+3)

### CONTENT:

Under the supervision of an appointed supervisor, the student will complete a clinical case load. This will include assessment, cast and measures, fabrication of the device, static and dynamic fitting, delivery and follow-up. The case load should cover, as much as possible, the full range of prosthetic devices.

The student will plan his or her work, make the appointments for the patient, collaborate with the interdisciplinary clinical team and make the necessary reports in the patient file and other required documentation. Above all the student will involve, and keep the patient informed throughout his/her course of treatment.

Throughout the clinical placement the student will maintain a log book recording each case he/she takes on. The student supervisor is responsible for providing feedback in this log book on each critical stage of the treatment process. This will, as

well, necessitate the supervisor to verify the student's quality of work, usually by way of the student presenting his case, at assessment, fitting and delivery stages.

### EXPECTED CLINICAL PLACEMENT PRODUCTION

Device Type	Recommended no. required
Partial Foot	2
Ankle disarticulation	3
Trans-tibial	5
Knee disarticulation	1*
Trans-femoral	5
Hip disarticulation	1*
Partial hand	1*
Wrist disarticulation	1*
Trans-radial	1*
Elbow disarticulation	1*
Trans-humeral	1*
Shoulder disarticulation	1*
<b>Total</b>	<b>23</b>

\*Optional (depending on patient availability) or 2-3 students can be allowed to attend to a single patient

Also, if the opportunity arises, additional devices (not listed) can be produced by the student e.g.:

- Trans-tibial total surface bearing (TSB) with silicone liner
- Trans-femoral with ischial containment socket (ICS)
- Silicone partial foot
- Trans-femoral with high-end modular knee joint

### RECOMMENDED BOOKS

Nil

## MOTION ANALYSIS

### CONTENT:

#### INTRODUCTION OF GAIT AND MOBILITY

- What is gait and mobility
- Why gait and mobility assessment and analysis is important
- Assessment and analysis techniques

#### NORMAL GAIT

- The gait cycle
- Kinematics and Kinetics
- Temporal studies of gait
- Centre of gravity (C of G) and ground reaction force (GRF)
- Moments and the their effect on muscle activity and joint angular movements
- Energy expenditure

### **PATHOLOGICAL GAIT**

- Pathological gait analysis
  - Primary and secondary gait deviations
  - Review of prosthetic gait deviations
- Energy expenditure
  - Amputee (various levels)
  - Bilateral amputees
  - Orthotic users
  - Using mobility aids

### **GAIT LAB ANALYSIS**

- Gait lab set-up and equipment
  - Markers
  - Transducers
  - Force plate
  - Cameras
- Data collection and analysis
  - 2D and 3D studies
  - Foot pressure analysis
  - Joint moments and forces
  - Butterfly diagrams
  - Normal and pathological patterns
  - Outcome measures from gait analysis

### **MOBILITY ASSESSMENT TOOLS**

- Timed up and go
- Gross Motor Function Classification System (GMFCS)
- Berg Balance Scale, etc.

### **PRACTICAL SESSIONS**

- Gait lab excises
- Clinical gait and mobility analysis

### RECOMMENDED TEXT BOOKS:

8. *Clinical Gait Analysis: Theory and Practice*, by Christopher Kirtley, Churchill Livingstone, 1<sup>st</sup> Edition, 2006
9. *Whittle's Gait Analysis*, by Whittle, Levine & Richards, Churchill Livingstone, 5<sup>th</sup> Edition, 2012
10. *AAOS Atlas of Orthoses and Assistive Devices* by Hsu, Michael and Fisk, 4<sup>th</sup> Edition
11. *Orthotics and Prosthetics Rehabilitation* by Lusardi, Jorge and Nielsen, Elsevier
12. *Prosthetics and Orthotics: Lower Limb and Spinal* by Ron Seymour; Publisher Lippincott Williams and Wilkins, Edition 1, 2002.
13. *The Basics of Biomechanics* by R.P. Susan J Hall
14. *Kinesiology* by Dena Gardener
15. *FO Lower Limb Orthotics* by the ICRC Physical Rehabilitation Programme (OTVETC)
16. *Trans-tibial Prosthetics – Coursework Manual* by ICRC/CSPO (Tome 1 and 2)
17. *AFO Lower Limb Orthotics* by the ICRC Physical Rehabilitation Programme (OTVETC)
18. *FO Lower Limb Orthotics* by the ICRC Physical Rehabilitation Programme (OTVETC)

