Curriculum

Of

4 Years B.Sc. HONS Orthotics and Prosthetics

Government College University, Faisalabad

Curriculum

1st Year

1st Semester

Course code	Course title	Credit Hr.
MTH-111/BIO-111	Mathematics / Biology	3 (3-0)
BOP- 301	Introduction to Orthotics & Prosthetics and Workshop	4 (4-0)
DPT- 406	Behavioral Sciences (Psychiatry & Psychology)	2 (2-0)
PHY-325	Introduction to physics	3 (3-0)
CSI- 321	Introduction to Computing Applications	3 (3-0)
ISL- 321	Islamic Studies / Ethics	2 (2-0)
Total		17

2nd Semester

Course code	Course title	Credit Hr.
DPT- 301	Upper Limb & General Anatomy	3 (2-1)
PSH-308	Systemic Physiology	3 (2-1)
MLT- 401	Materials Technology	3 (3-0)
ENG- 321	Functional English	3 (3-0)
PST- 321	Pakistan Studies	2 (2-0)
BCH- 407	Biochemistry	2 (2-0)
Total		16

2nd Year

3rd Semester

Course code	Course title	Credit Hr.
DPT- 302	Lower limb Anatomy	3 (2-1)
PSH- 409	Physiology of Nervous system, Neuro-muscular physiology	3 (2-1)
AHP- 302	Pathology	2 (2-0)
BOP- 401	Orthopaedic interventions in orthotics & Prosthetics	3 (3-0)
MLT- 301	Technical Drawing	3 (2-1)
BOP- 403	Introduction to Physiotherapy	2 (2-0)
Total		16

4th Semester

Course code	Course title	Credit Hr.
DPT- 401	Head and Neck (vertebral column)	3 (2-1)
BOP- 402	Rehabilitation and Sports Medicine & Mobility aids	4 (3-1)
BOP- 404	Metal Work	3 (2-1)
BOP- 406	Electro Work	3 (2-1)
BOP- 408	Lathe Machine Work	3 (2-1)
STA-322	Bio-Statistics	2 (2-0)
Total		18

3rd Year
5th Semester

Course code	Course title	Credit Hr.
BOP- 511	Upper Limb Orthotics I	3 (2-1)
BOP- 513	Spinal Orthotics I	3 (2-1)
BOP- 515	Lower Limb Orthotics I	3 (2-1)
BOP- 519	Upper Limb Prosthetics I	3 (2-1)
BOP- 521	Lower Limb Prosthetics I	3 (2-1)
BOP- 525	Biomechanics I	3 (3-0)
Total		18

6th Semester

Course code	Course title	Credit Hr.
BOP- 512	Upper Limb Orthotics II	3 (2-1)
BOP- 514	Spinal Orthotics II	3 (2-1)
BOP- 516	Lower Limb Orthotics II	3 (2-1)
BOP- 520	Upper Limb Prosthetics II	3 (2-1)
BOP- 522	Lower Limb Prosthetics II	3 (2-1)
BOP- 526	Biomechanics II	3 (3-0)
Total		18

4th Year
7th Semester

Course code	Course title	Credit Hr.
BOP- 527	Biomechanics III	3 (2-1)
BOP- 523	Lower Limb Prosthesis III	3 (2-1)
BOP- 517	Lower Limb Orthosis III	3 (2-1)
DPT- 657	Scientific Inquiry & Research Methodology	3 (3-0)
BOP- 601	Workshop practices I	3 (0-3)
BMS- 410	Clinic, Workshop and Business Management	2 (2-0)
Total		17

8th Semester

Course code	Course title	Credit Hr.
ELT- 321	Fundamentals of Electricity and Electronics	3 (3-0)
CIT- 639	CAD-CAM Technology	3 (2-1)
BOP- 602	Workshop practices II	4 (0-4)
DPT- 681	Research Project	6 (0-6)
Total		16

Total Degree Credit Hour = 136

1st YEAR
1st SEMESTER

Mathematics:

CREDIT HOURS 3 (3-0)
Course Code: MTH- 111

DETAIL COURSE OUTLINE

Mathematics

- Algebraic manipulation;
- Trigonometry;
- Functions, polynomial, rational, exponential, logarithmic;
- Differentiation;
- Integration;
- Differential equations.

Biology:

CREDIT HOURS 3 (3-0)
Course Code: BIO- 111

DETAIL COURSE OUTLINE

Biology

- Introduction to biology
  - Cell and cell processes
- Homeostasis
- Human systems
  - Integumentary system
  - Skeletal system
  - Muscular system
  - Nervous system
  - Circulatory system
  - Respiratory system
  - Immune system
  - Digestive system
  - Reproduction system
  - Excretory system
  - Endocrine system

Introduction to Orthotics & Prosthetics and Workshop:

CREDIT HOURS 4 (4-0)

Corse Code: BOP- 301

DETAIL COURSE OUTLINE

Introduction to orthosis

- Definition of orthosis
- Classification
- Types
- Action of orthosis
- Mechanism of orthosis
- Indications of orthosis
- Effects of orthosis

Introduction to prosthesis

- Definition of prosthesis
- Causes of amputation
- Levels of amputation
- Pre assessment for amputation
- Pre amputation Counseling and preparation

Materials and Tools used in Orthotics and Prosthetics

- Material used in orthosis
- Material used in prosthesis
- Tools for measurement and casting
- Tools used in moulding and fabrication
- Tool used in model making and rectification

General principles of Measurement & Casting

- Measurement taking
- Principles of marking and measurement
- Measurement taking of orthosis
- Measurement taking of prosthesis
- Principles of casting

General principles of Mould making and Rectification

- Principles of rectification
- Principles of modeling

Safety Procedures

Behavioral Sciences (Psychiatry & Psychology):

CREDIT HOURS 2 (2-0)

Course Code: DPT- 406

DETAIL COURSE OUTLINE

- Introduction to Behavioural Sciences and its importance to health Application of Behavioral Sciences Behavioral sciences in medical practice.
- Understanding Behavior, Sensation and sense organ, Perception
- Attention and concentration
- Memory
- Thinking
- Communications
- Individual differences
- Personality
- Psychodynamic
- Theories of personality
- Intelligence
- Emotions
- Motivation/need/drive
- Learning
- Life events and illness
- Stress and stressors
- Stress management
- Doctor-Patient Relationship
- Interviewing / psychosocial history taking
- Medical ethics
- cultural and medical practice
- Psychological Relation illness and behavior (sick-role, stigma, somatization treatment adherence (Compliance)
- Breaking bad news
- Psychosocial aspect of health and diseases
- Pain, sleep , consciousness
- Communication skills counseling crises intervention, conflict resolution informational care
- Principles of effective communication

Introduction to Physics:

CREDIT HOURS 3 (3-0)

Course Code: PHY-325

DETAIL COURSE OUTLINE

- Introduction to physics
- Magnetic Resonance Imaging
- Images from radioactivity: radionuclide scans
- Diagnostic x-rays and CT-scan;
- Applied Medical Physics
- Biomedical measurements:
- Physics in Medicines:
- Biomedical applications of physics including
- Physics of Human Body
- Nuclear Physics
- Atomic Physics
- Electricity
- Optics:
- Waves and Oscillations
- Fluid Dynamics
- Mechanics

Introduction to Computing Applications:

CREDIT HOURS 3 (3-0)

Course Code: CSI- 321

DETAIL COURSE OUTLINE

- To know the basic of computer
- How to operate the computer
- To make Word files
- To make power point presentation
- How to make internet connection
- How to send email
- How to get any reference from different websites
- How to enter data for research

Islamic Studies / Ethics:

CREDIT HOURS 2 (2-0)

Course Code: ISL- 321

DETAIL COURSE OUTLINE

اسلامیات لازمی

عقیدۂ توحید تا عبادات

امر بالمعروف ونہی عن المنکر تا دعوت دین کا طریق کار

اتحاد امت تا کسب حلال

حقوق العباد تا حصول انصاف کا حق

حقوق نسواں تا خطبہ حجۃ الوداع

اسوۂ حسنہ سیرت طیبہ تا وصال نبی پاک ﷺ

نبی کریم ﷺ بحیثیت معلم تا نبی کریم ﷺ بحیثیت تا جر

2nd SEMESTER
ANATOMY I
CREDIT HOURS 3 (2-1)
Course Code: DPT- 301

Course Description:

The student should understand the function of individual joints and muscles and be proficient in explaining their interaction. He/she should be knowledgeable in the area of clinical conditions and be able to analyze them by means of appropriate measuring instruments as well as by applying his/her knowledge of range of motion in order to be able to identify a viable prosthetic/orthotic treatment. The student should recognize that biomechanical as well as pathological factors must be viewed concurrently with anatomical factors.

The student should be able to meet the following learning objectives:

• Explain the process of human growth and development;
• Demonstrate competence in identifying and differentiating between surface anatomical structures of the lower limb, upper limb spine and trunk;
• Understand the inter-relations between the systems described. (Student should know origin, insertion, nerve connection and blood supply of each muscle)
• Describe and relate the structure and function of the upper and lower limbs to clinical pathologies

DETAILED COURSE OUTLINE

Cell Biology
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
- Classification of bones
- 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
- Raphaes
- Ligaments
- Condyle
- Epicongyle
- 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
- 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 in-ferior vena cava, and 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

PHYSIOLOGY I

CREDIT HOURS 3 (2-1)

Course Code: PSH- 308

Course Description:

The course is designed to assess the students to acquire the knowledge of the normal physiology of human body and understand the alteration in the physiology for the fabrication of the prosthesis and orthosis.

The student should be able to meet the following learning objectives:

- Describe and explain cell biology;
- Explain and give examples of basic tissues, their properties and structure;
- Compare and contrast the structure and properties of biological substances (i.e.: blood, lymphatic fluids, serum);
- Describe parts and organs of the body by systems.

DETAIL COURSE OUTLINE

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

Cardiovascular System

- 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

1. Clinical significance of cardiac cycle, correlation of ECG and heart sounds to cardiac cycle
2. Clinical significance of cardiac cycle, interpretation of ischemia and arrhythmias

3. Effects of hypertension
4. Clinical significance of heart sounds
5. Effects of ischemia
6. Shock

Gastrointestinal Tract:

- Structure and General Functions
- Enteric nervous system (Gut Brain)
- Mastication, Swallowing and their control
- Functions and movements of stomach
- Functions and movements of small intestine
- Functions and movements of large intestine
- Hormones of GIT
- Vomiting and its pathway
    - Vomiting and effects
- Defecation and its pathway
    - Diarrhoea, Constipation
- Functions of Liver
    - Jaundice, Liver functions tests

Respiratory System

- Organization/functions of Respiratory Tract
- Functions of Lungs (respiratory & non respiratory)
- Types of respiration (Intrapleural pressure, pneumothorax, effusion)
- Mechanics of Breathing
- Surfactant and Compliance
- Lung function tests (Spirometry)
- Protective reflexes
- Lung volumes and capacities
    - Dead space
- Diffusion of Gases (gas laws, composition)
- Ventilation/perfusion
    - Transport of O2 in blood
    - Transport of CO2 in blood
- Regulation of respiration (Nervous/Chemical)
- Respiratory failure
- Abnormal breathing
- Hypoxia-types and effects
- Physiology of Cyanosis Artificial respiration
- Physiology of high altitude, space, deep sea diving
- Oxygen debt
- Respiratory changes during exercise

Renal system:

- Compartments of body fluids & measurement

    - Renal function tests
- Tissue and lymph fluids
    - Fluid Excess/depletion
- Structure of Kidney/Nephron
- General functions of kidney
- GFR-factors regulating
- Formation of urine, filtration, reabsorption, secretion
- Plasma Clearance
- Concentration & Dilution of urine
    - Renal failure/uraemia
- Electrolyte Balance
- Water Balance
- Regulation of blood pressure by kidneys
    - Nephrotic syndrome
- Hormones of kidneys
- Acidification of urine
- Artificial kidney/Hemodialysis
- Acid Base balance
    - Metabolic acidosis/alkalosis
- Micturition

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

Materials Technology:

CREDIT HOURS 3 (3-0)

Corse Code: MLT- 401

Course Description:

Students would have competence in practicing effectively and safely within a workshop environment.

The student should be able to meet the following learning objectives:

• Explain the important properties of various types of materials: metals, ceramics, polymers, and composites.
• Describe the relationships that exist between the structural elements of these materials and their characteristics.
• Explain mechanical and failure behavior of these materials, along with techniques used to improve the mechanical and failure properties in terms of alteration of structural elements.
• Describe the basis for the selection of different materials for specific prosthetic and orthotic applications.
• Demonstrate knowledge of toxicity and safety issues associated with the use of specific materials.

DETAIL COURSE OUTLINE

Biomaterials

- Application of materials in medicine, biology, and artificial organ
- Cardiovascular medical devices
- Metals used for implants

Material

- Materials science
- Materials engineering
- Types and applications of materials

Immune response to biomaterial

Soft tissue biomaterials

Orthopedic implants

Metal & Alloys:

- Fundamentals of metals and alloys both ferrous and nonferrous. Properties, testing and inspection of metals and alloys, heat treatment of metals. Powder metallurgy, surface coating of metals.

Wood:

- Wood, types, seasoning, preservation, lamination properties and adhesives for wood. Wood work: Introduction to Wood, wood work and wood working tools. Pattern making and making of various kinds of joints.

Leather:

- Leather, types, tanning, preservation, lamination, properties and adhesives for leather.

Fabric:

- Fabric types, properties, utilization, selection and quality control
- Polymers & composite materials
- Introduction to Plastics, type of plastics and molecular structures.
- Relationship of properties to structures.
- Monomers, Polymers, additives, Mechanical properties, effect on properties of method of production
- Fabrication processes, Effects of fabrication, process, micro structural changes, shrinkage and other degradation during processing, environmental effects
- Thermoforming plastics, their fabrication process, thermosetting plastics and fabrication process Composite materials and their uses
- Resin: Acralyic and Polyster. Elastomers, H.D.P.E. PP, PP-CP, Visoelastic behavior of plastics
- Introduction to fiber reinforced plastics, Introduction to and their processing especially various techniques of moulding and lamination
- Joining of plastics, welding, adhesives and their effect on structure and plastics properties.

Foams:

- Different types of foams used in P&O especially Latex, Polyurethane, polyethylene and other kind of rigid/semi rigid/ flexible foams. Plaster of Paris & Silicon and its application procedure in Prosthetic & Orthotic techniques

Biochemistry

CREDIT HOURS 2 (2-0)

Course Code: BCH-407

DETAIL COURSE OUTLINE

Introduction of Biochemistry:

Biochemistry of the Cell:

- Introduction to cell (Biochemical point of view)
- Scientific methods to study the cell biochemistry
- Biochemical composition of the cell

Biochemistry of the Cell and Body Fluids:

- Ionization of water & weak acids, bases
- Concept of pH, and pH scale
- Dissociation constant & titration curve of weak acids, the concept of pK values
- Buffers, their mechanism of action
- Henderson-Hesselbalch Equation **(No derivation)**
- Types of particles, solution
- Importance of selectively permeable membranes, osmosis, osmotic pressure, surface tension, viscosity & their importance related to body fluids

Carbohydrates:

- Definition, biochemical function and classification
- Structure and functions of Monosaccharides, and their derivative
- Disaccharides, their important examples
- Oligosaccharides, their combination with other macromolecules
- Polysaccharides, their important examples and biochemical role
- The biomedical importance of carbohydrates
- Metabolism of carbohydrate

Proteins:

- Definitions, Biomedical importance and classification of proteins based on
  -Physiochemical properties
  -Functional
  -Nutritional
  - Structural
- Amino acids, their structure, properties & functions
- Classification and nutritional significance of amino acids
- Dissociation, titration and importance of amino acid in pH maintenance
- Structure of proteins and their significance
- Separation of proteins e.g. salting out, Electrophoresis, Chromatography, Centrifugation
- Immunoglobulins and its biomedical significance
- Plasma Proteins & their clinical significance
- Metabolism of protein

Nucleotide & Nucleic Acid:

- Chemistry and structure of nucleosides and their biochemical role
- Nucleotides, structure, their derivatives and their biochemical role
- Synthetic derivatives of purine and pyrimidines, their role in health and disease

- Nucleic acids, their types, structure and functions
- Metabolism of nucleotide & nuclei acid

Lipids:

- Definition, biomedical function
- Classification of lipids
- Phospholipids, Glycolipids, Sphingolipids and their Biochemical Significance
- Fatty acids, chemistry, classification and biochemical function
- Essential fatty acids
- Eicosanoids, their classification and functions in health and disease
- Steroids, Sterol e.g. Cholesterol, their chemistry, functions and clinical significance
- lipid peroxidation and its significance
- Metabolism of lipids

Biological Membrane:

- Biochemical composition
- Biochemistry of cell membrane, chemical composition, importance of lipid and proteins in membranes, chemistry of signals and receptors
- Biochemistry of membrane transport mechanism, active transport, passive transport, simple and facilitated diffusion

Enzymes:

- Introduction, definition, mechanism of catalysis
- Coenymes, co-factors
- Isoenzymes, their clinical importance
- Factors affecting enzymes activity, Michaelis-Menten Equation, Lineweaverburk equation and their application in enzyme kinetics (no derivation of equations)
- Enzyme inhibitors and their classification & biomedical importance
- Application of enzyme in clinical diagnosis and therapeutic use

Vitamins:

- Introduction, classification
- Chemistry, Biochemical Functions, Deficiency manifestations, daily allowances and source of water soluble and fat-soluble vitamins
- Hypervitaminosis

Biochemistry of Digestive Tract:

- Introduction of digestion and absorption
- Introduction, composition, functions, daily secretion, stimulants and depressants of
  - Saliva
  - Gastric Juice & HCL
  - Pancreatic Juice
  - Bile Juice
  - Succus Entericus
- Digestion and absorption of carbohydrates, proteins, nucleic acid and lipids
- Biochemical disorders of GIT, e.g. achlorhydria, peptic ulcers, lactose intolerance, cholelithiasis and related disorders

Mineral & Trace Elements:

- Classification and Biochemical role of:
  - Macro minerals (Na, K, Ca, Cl, PO4)
  - Micro minerals (Fe, Zn, Mg, Se, I, Cu, Cr, Cd, Mn)

Biochemical Genetics (Informational Flow in the Cell):

- The structural basis of the cellular information

- DNA, Chromosomes, Discovery and organization of DNA in Genomes
- Super coiling of DNA
- The replication of DNA (DNA dependant DNA synthesis)
  - DNA polymerase, its components and functions
  - Initiation, elongation and termination of Replication
  - DNA Repair, Mutation and Cancers
- The Transcription (DNA dependant RNA synthesis)
  - RNA polymerase, its components and functions
  - Initiation, elongation and termination of transcription
  - RNA processing
  - RNA dependant synthesis of RNA and DNA
  - Reverse transcription — DNA synthesis from Viral RNA
  - Retroviruses in relation to Cancer and AIDS
- The Translation (Protein Synthesis)
  - The genetic codes and their characteristics
  - Initiation, elongation and termination of protein synthesis
  - Post-translational modification
  - Regulation of Gene Expression
- Molecular biology technology
  - DNA isolation
  - DNA-recombinant technology
  - Hybridization, blotting techniques
- Genetic disorders

Biochemistry of water & Electrolyte imbalance and Acid Base Balance:

Functional English:

CREDIT HOURS 3 (3-0)

Corse Code: ENG- 321

DETAIL COURSE OUTLINE

- Discussion on nursing and non-nursing topics by using new vocabulary
- Grammar Recognition and production
- Oral presentations using clinical contexts.
- Reading
- Effective Writing
- Introduction to APA style.

Pak.Studies:

CREDIT HOURS 2 (2-0)

Corse Code: PST- 321

DETAIL COURSE OUTLINE

مطالعہ پاکستان

پس منظر قیام پاکستان تا قائداعظم کی نظر میں نظریہ پاکستان

نظریہ پاکستان کا تاریخی پہلو تا سیاسی جدوجہد

منزل کا تعین تا تحریک قیام پاکستان

قیام پاکستان کا عمل تا ارض پاکستان

پاکستان اور عالم اسلام

2nd YEAR

3rd SEMESTER

Anatomy II:

CREDIT HOURS 3 (2-1)

Corse Code: DPT- 302

DETAIL COURSE OUTLINE

Gross Anatomy:

- Lower limb Anatomy

Surface Anatomy of lower limb

Osteology:

Neurology:

Angiology (Circulation):

Arthrology:

Demonstrations:

- Demonstration on all joints

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

Physiology II:

CREDIT HOURS 3 (2-1)

Corse Code: PSH- 409

DETAIL COURSE OUTLINE

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

1. Perform nerve conduction studies and explain their clinical importance
2. Myopathies and neuropathies
3. Peripheral nerve injuries

Nervous system:

- Organization of Nervous system
    - Significance of Dermatomes
- Classification of nerve fibres
- Properties of Synaptic transmission
- Neurotransmitters and neuropeptides
- Types and function of sensory receptors
    - Receptors & Neurotransmitters
- Functions of spinal cord, ascending tracts
- Reflex action/ reflexes
- Muscle spindle / muscle tone
- Tactile, temperature and pain sensations
- Structure of cerebral cortex
- Sensory Cortex
- Motor Cortex
- Motor pathways, (Pyramidal & extra pyramidal)
- Basal Ganglia, connections and functions
- Cerebellum, connections and functions
- Vestibular Apparatus/Regulation of Posture & Equilibrium
- Reticular formation
- Physiology of sleep/EEG
- Physiology of memory
- Physiology of speech
- Thalamus-Nuclei & functions

- Hypothalamus & limbic System
- Cerebrospinal fluid
- Regulation of body temperature
- Functions of skin Hydrocephalus
- Autonomic Nervous System
- Physiology of aging

Pathology:

CREDIT HOURS 2 (2-0)

Corse Code: AHP- 302

Course Description:

The student should be able to describe and contrast the etiology and progression of diseases and to identify early signs and symptoms of conditions that are commonly encountered by prosthetists/orthotists. In addition, s/he should be able to advise on care and appropriate treatment options.

The student should be able to meet the following learning objectives.

• Describe the basic pathological processes that underlie disease (e.g.: cell injury and necrosis, inflammation and healing, ischemia, infarction and neoplasia);
• Apply knowledge of basic pathological processes to explain the etiology, pathogenesis, structural and functional manifestations of diseases commonly encountered in clinical practice, including relevant conditions affecting locomotion and body systems (musculoskeletal system and nervous system, vascular system).

DETAIL COURSE OUTLINE

Cellular Basis of Disease

- Cellular responses to stress ;Adaptations of growth and differentiation Hyperplasia
- Hpertrophy, Atrophy, Metaplasia
- Cell injury and cell death, Causes of Cell injury
- Mechanisms of cell injury, Reversible and irreversible cell injury
- Morphology of cell injury and necrosis, Apoptosis
- Sub cellular responses to injury, Intracellular accumulation, Pathological calcification

Inflammation and healing

- Acute Inflammation, Chemical mediators of inflammation
- Outcomes of acute inflammation
- Morphologic patterns of acute inflammation
- Systemic effects of inflammation
- Mechanisms of tissue regeneration
- Repair by healing, scar formation and fibrosis

Hemodynamic disturbances

- Edema
- Hyperemia and congestion
- Hemorrhage
- Hemostasis and thrombosis
- Embolism, Infarction

Shock

- Differentiate the non-neoplastic excessive and neoplastic growths
- Understand the differences between benign and malignant tumors
- Understand the classification of different tumors

- Understand the TNM classification of malignant tumors
- Define and describe hyperemia and congestion, edema, hemorrhage, thrombosis, infarction and embolism ,
- Describe shock. And its different types. Understand the mechanisms leading to shock.
- Describe the organization of nuclear material, its replication and division.
- Understand different modes of inheritance
- Describe the different types of genetic aberrations.
- Understand the basis of molecular diagnosis of genetic disorders
- Define the components of the immune system.
- Understand the innate and adaptive immunity, the classes of immunoglobulin.
- Define humoral and cellular immunity.
- Define the differences between immunity and hypersensitivity.

Orthopaedic interventions in orthotics & Prosthetics:

CREDIT HOURS 3 (3-0)

Corse Code: BOP- 401

DETAIL COURSE OUTLINE

Fractures & Dislocations

a. Bone physiology
b. Fracture mechanics
c. Fracture healing
d. Fracture classification
    - By cause (traumatic, pathological)
    - By orthopedics (open, close)
    - By nature of fracture (transverse, oblique, linear, spiral, comminuted)
    - Anatomical
    - OTA classification (Orthopedic Trauma Association)
    - Orthopedic management of fracture

Amputation

- Indications/causes,
- General Principles,
- Types of amputation
- Amputation techniques
- Osteoplastic Myoplastic,
- Osteo-myoplastic,
- Individual's Preparation for prosthesis. Ideal stump.
- Preoperative, operative and postoperative prosthetic management techniques in general.

Amputation Surgery:

- Amputation surgery in lower and upper limbs.
- Amputation in special circumstances, like in infants and children,
- Congenital limb deficiencies and its universal classification,
- Ischemic limbs,
- Elderly persons and malignancy.

Orthopaedic disorder:

- Osteoporosis, osteopenia, osteopetrosis
- Osteoarthritis, Rheumatoid Arthritis, Septic Arthritis, Osteomalacia
- Disorders of joints (shoulder, elbow, wrist, hip, knee and ankle)

Neurological Disorders

- Cerebral palsy
- Friedreich's ataxia
- Spina bifida
- Poliomyelitis
- Motor neuron disorder

- Arthrogryphosis multiplex congenital
- Muscular dystrophies

Spinal deformities:

- Scoliosis
- Khyphosis
- Extensive Lordosis
- Paget disease
- Ankyloses spondylitis, spondylosis, spondylolysis, spondylolisthesis

Age related disorders, Chiropody

Congenital deformities

- Congenital talipes equinovarus (CTEV)
- Congenital vertical talus(CVT)
- Osteogenesis imperfect (OI)
- Congenital limb discrepancies

Introduction to x-ray interpretation

Alignment & adequacy

- Type of x-ray views taken and the anatomical site visualized

Bones - outline & density

Cartilage - outline, joint space & loose bodies

Normal x- ray interpretation of:

- Upper limb
- Lower limb
- Spine

Abnormal x- ray interpretation of:

- Upper limb
- Lower limb
- Spine

Technical Drawing:

CREDIT HOURS 3 (2-1)

Corse Code: MLT- 301

Course Description:

The course is designed to assist the students to acquire an introduction to concepts of drawing instruments and their uses, general principles and the basic elements of technical drawing.

The student should be able to meet the following learning objectives:

- Describe about the drawing instruments and their uses
- Describe the general principles of drawing and technical drawing
- To draw isometric sketching and 3D visualizing
- Explain use of drawing standard
- Draw 1st and 3rd angle projection, auxiliary views and simple assembly drawings
- Explain the application of machine tolerances
- Describe about the general sketching

DETAIL COURSE OUTLINE

- **Introduction:** Drawing instruments and their uses. Sizes and layout of drawing sheets. Item references on drawings and item lists. Planning on assembly.
- **General Principles:** Folding of Drawing prints Scales. Plain and diagonal, Lines, Letterings. General principles of presentations. Section and other conventions Conventional representations circle, Tangent Ellipse. Cycloised Involute of circle.
- **Fundamentals:** Dimensions on technical drawings. Indications of linear and angular tolerance on technical drawings. Orthographic projections of points, lines, simple objects and combinations. Isometric views, Auxiliary view, Drawing of screw thread form Bolts Screws and Screw joints, weld and welded joint dimensioning and sketching of P & O components/ parts, pulley shaft, coupling, etc.
- **Design:** Design calculations and its applications for Prosthetics & calculation Orthotics devices.
- **General Sketching:** Sketching for preparing assembly, workshop drawing. Various parts and Components used in prosthetics and orthotics, Basic idea of design analysis, itemization empiricism, approximation and synthesis. Detail diagrams of all kind orthoses, prostheses and mobility aids.
- **Practical:** All kinds of engineering drawing practice.

Introduction to Physiotherapy:

CREDIT HOURS 2 (2-0)

Corse Code: BOP- 403

DETAIL COURSE OUTLINE

- Introduction to physiotherapy
- Planes and Axes
- Kinesiology, kinematics, kinetics
- Force, lever, ROM
- Effect of gravity forces on muscle
- Therapeutic exercises
- Electrotherapy
- Actinotherapy.
- Types of radiations and effects

4th SEMESTER

Anatomy III:

CREDIT HOURS 3 (2-1)

Corse Code: DPT- 401

DETAIL COURSE OUTLINE

GROSS ANATOMY:

- Head and Neck (vertebral column)

Surface Anatomy of Head and Neck (vertebral column)

Osteology:

Neurology:

Angiology (Circulation):

Arthrology:

Demonstrations:

- Demonstration on all joints

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

Rehabilitation and Sports Medicine & Mobility Aids:

Corse Code: BOP- 402

CREDIT HOURS 4 (3-1)

Course Description:

The course is designed to assist the students to develop understanding of the health and socio economic context of people with disabilities in the community and their role and the role of CBR and introduce different members of the clinic team and theoretical principles of rehabilitation. Students would learn about the use of various types of mobility aids required by PWDs and related analysis of the gait pattern.

The student should be able to meet the following learning objectives

- Recognize members of the clinic team and identify benefits associated with a team approach
- Describe and discuss theoretical principles of rehabilitation;
- Describe theories related to the psychology of loss and disability;
- Discuss the social causes of disability in India and the link between poverty and disability.
- Reflect and analyze on their attitude/values and attitudes towards persons with disabilities, their families and the community (Socio-cultural and religious)
- Explain the UN convention rights and role as prosthetist and orthotist
- Explain the different approaches to rehabilitation.
- Explain different component of CBR and the guiding principles of CBR implementation.
- Explain P & O role in a CBR programme
- Explain the prescription of commonly used mobility aids like crutches, walking stick, and walkers.
- Assess and prescribe the best possible mobility solution for a wheelchair user
- Carry out repair and maintenance of wheelchair
- Describe the correct use of the wheelchairs, transfers and various modifications of wheel chairs
- Train users to make the best use of their wheelchair.
- Assess, prescribe and fabricate different types of developmental aids
- Describe the analysis of gait with the related mobility aids.

DETAIL COURSE OUTLINE

- Psychology of loss and disability
- Age related disorders, Chiropody
- Demyelination disorders of peripheral nervous system
- Peripheral vascular diseases
- Congenital deformities
- Skin disorders related to O & P
- Stroke
  Definition, Types, Causes, General orthopedic management, Orthotic management

- Myotonic disorders
  Definition, Types, Causes, General orthopedic management, Orthotic management
- Connective tissue disorder
  Definition, Types, Causes, General rehabilitation, Orthotic management
- Sports & exercise medicine
  Prevention of injuries, Clinical education & diagnostic, immediate care, Treatment, rehab & reconditioning
- Achondroplasia
  Definition, Causes, General orthopedic management, Orthotic management
- Hypochondroplasia
  Definition, Causes, General orthopedic management, Orthotic management
- Heredity multiplex exostosis
  Definition, Types, Causes, General orthopedic management, Orthotic management
- Metaphysical chondroplasia
  Definition, Causes, General orthopedic management, Orthotic management
- Dyschondroplasia
  Definition, Causes, General orthopedic management, Orthotic management
- Pseudochondroplasia
  Definition, Causes, General orthopedic management, Orthotic management
- Diaphysial dysplasia
  Definition, Causes, General orthopedic management, Orthotic management
- Osteoporosis
  Definition, Causes, General orthopedic management
- Osteopetrosis (marble bones, Alber's – Schonberg Disease)
  Definition, Causes, General orthopedic management

Mobility and Walking aids:

- Canes, walking sticks, Crutches - auxiliary, elbow and forearm support.
- Different types of Walking Frame, Walker and their attachments. Para podium etc

Developmental aids:

- Biomechanics of various kinds of developmental aids
- Normal milestone and delayed milestone
- prescription, design and materials used
- measurement techniques
- fabrication of Box seat
- Special Chair with or without table/tray
- Standing/ tilting frame
- Low-level cart
- Prone board and various developmental and educational toys.
- Maximum use of Appropriate Technology while making developmental aids.

Molded seats:

- Biomechanics of various kinds of molded seats
- prescription criteria
- cast and measurement techniques
- Cast modifications
- fabrication of molded seats with inside or outside posting

- use of different materials and technologies to fabricate the same
- Suspension or right kinds of strapping.

Wheelchair:
Manual wheelchair:

- Benefits of appropriate wheelchair for a wheelchair user
- Features and benefits of 'sitting upright' in wheelchair
- Types of wheelchair
- cushion and its components and its safe handling
- pressure relief techniques
- user assessment
- prescription
- measurement
- fitting
- Transfer techniques
- Wheelchair mobility skills
- Care & Maintenance of Wheelchairs and importance of wheelchair user instructions.
- Cushions and its fabrication technique & wheelchair modification.

Other types:
Introduction:

- Motorized wheelchair, tricycle and motorized tricycle
- Modified two wheeler for mobility.
- Gait Training with various walking aids
- Installation/ fabrication of Parallel bars.

Self-help devices:

- Special gadgets to assist in activities of daily living (A.D.L.) – assistive device for SCI patients, stroke patients etc.

Metal Work:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 404

DETAIL COURSE OUTLINE

Metal work:

- Introduction of work bench tool
- Care & application of vernier caliper, marking with vernier caliper
- Height gauge
- Introduction of drill machine
- Calculate & select the RPM
- Drilling of cylindrical hole, reaming of hole, typing of hole, countersinking and counter boring. Twist drill sharpening, marking with central punch
- Introduction to piller drill machine, calculate & select the RPM
- Drilling of cylindrical hole on drill machine, internal thread cutting by hand, calculate the drill of reamer, reaming of the hole by hand
- Fitting of two parts (square fitting), fitting of two parts (dove tail fitting).
- Safety and Caution

Practical:

- Practice of all related topics

Electro Work:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 406

DETAIL COURSE OUTLINE

Electro technology:

- Basic Concepts
- DC Circuits
- Inductance and Capacitance
- AC Circuits
- Power Supplies
- Amplifiers
- Feedback
- Interference Rejection Techniques
- Myoelectrodes
- Welding
- Safety.

Practical:

- Practice of all related topics

Lathe Machine Work:

CREDIT HOURS 3 (2-1)
Course Code: BOP- 408

DETAIL COURSE OUTLINE

Constance of lathe machine:

- Introduction of lathe machine,
- calculate and select the RMP on lathe machine,
- type of turning tool
- Type of threading.

Operational work:

- Facing/ central drilling
- Turning, step turning
- Threading
- Bore ring
- Offhand grinding
- Preparation of cutting tools
- Filling of the flat surface by hand.

Practical:

- Practice of all related topics

Bio-Statistics:

CREDIT HOURS 2 (2-0)

Course Code: STA- 322

DETAIL COURSE OUTLINE

Introduction:

- Meaning of Statistics
- What is Bio- Statistics?
- Why Bio- Statistics (Essential for Research)
- Main Division of Statistics
    - Descriptive and
    - Inferential Statistics
- Population and samples
- Definition of Data
- Data Analysis and presentation of results

Presentation of Data

- Introduction
- Frequency (Qualitative Data)
- Frequency Distributions (Quantitative Data)
- Histogram
- Pie chart
- Frequency Polygon
- Frequency Distributions of the Population
- Shapes of frequency distributions
- Scattered Diagram

Measures of locations

- Arithmetic mean
- Median
- Mode
- Geometries Mean
- Quartiles

Measures of Variation

- Introduction
- Range
- Standard deviation
- Quartile deviation
- Mean deviation
- Standardized Variable
- Co-official of variation
- Skewness

Probability

- Introduction

- Probability calculations
- Multiplicative rule
- Additive rule
- Binomial Distribution
- Poisson Distribution
- Normal Distribution

Confidence interval for mean

- Introduction
- Large Sample case (Normal Distribution)
- Smaller Samples
- Confidences interval using t-distribution
- Severe non Normality
- Summary of Alternatives

Statistical Inference

- Estimation
- Point estimation
- Standard error
- Interval estimation
- Testing of Hypothesis
- P-Value
- Calculation of required Sample size

Significance tests for a single mean

- Introduction
- t-test
- Pared t-test
- Relation between Confidence intervals and significance tests
- One sided and two sided tests
- One simple t-test
- Normal test

Comparison of two Means

- Introduction
- Sampling distribution of difference between two means
- Normal test (Large Sample or known standard deviation)
- t-test (Small samples, equal standard deviation)
- Small samples, un-equal standard deviation

Correlation and linear regression

- Introduction
- Correlation
- Significance test
- Linear Regression
- Significance test
- Prediction
- Assumptions

Proportions

- Introduction
- Significance test for a single proportion
- Confidence interval for a single proportion
- Significance test for comparing two proportions
- Confidence interval for different between two proportions

The chi-squared test for contingency tables

- Introduction
- 2x2 contingency table
- Continuity correction
- Comparison with normal test
- Validity
- Quick formula
- Short formula for 2xc tables
- Exact test for 2x2 tables

Research and Methodology

- What is research?
- Why we need research
- Advantages of doing research
- Identification of research needs
- Selection of topic
- Formulation of objectives
- Work plan
- Budgeting
- Literature research

Epidemiology

- Introduction
- Cohort studies
- Relative risk
- Attributable risk
- Incidence rate, incidence risk and odds ratio
- Case-control studies
- Matched designs

Sampling Methods

- Introduction
- Simple random sampling
- Systematic Sampling
- Stratified Sampling
- Multistage Sampling
- Cluster Sampling
- Sampling and non-Sampling error

3rd year
5th semester

Upper Limb Orthotics I:

CREDIT HOURS 3 (2-1)
Course Code: BOP- 511

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Orthotic theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design. Describe and compare temporospatial and kinematics characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate orthotic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of orthotic components.
• Formulate appropriate orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

DETAIL COURSE OUTLINE

- **Introduction to upper limb orthotics**:

Static orthosis, dynamic orthosis, functional orthosis, assessment (mobility, strength, sensation, skin conditions)

- **Finger and thumb orthotics:**

Mallet deformity and mallet finger splint, swan neck deformity, boutonniere deformity and boutonniere splint, dupuytren's contracture and orthosis, orthosis for flexor-tendon repair, bunnel finger extension orthoses, capener/ Radford splints, PIP

joint extension orthosis(armchair Splint) dorsal PIP joint Blocking Orthosis, joint jack, thumb immobilizing splint, web spacer.

- **Hand, wrist and forearm orthotics:**

Splinting positions (position of safe immobilization, position of function, position of rest) post-operative orthosis for metacarpophalangeal implant arthroplasty, splinting for burn injuries, web spacers.

- **Hand and wrist orthosis:**

Opponens orthoses, short opponens orthosis, wrist flexion control orthoses, wrist extension orthoses, prehension orthoses, finger driven prehension orthosis, wrist driven prehension orthosis, positioning orthosis, rheumatoid resting orthosis, slot through orthosis, dorsal protective orthosis (with or without thumb extension), metacarpophalangeal arthroplasty orthosis, metacarpophalangeal flexion/ extension assist orthosis, proximal interphalangeal extension assist orthosis, radial nerve palsy orthosis, burn- finger nail traction orthosis, metacarpophalangeal flexion orthosis, ulnar drift orthosis, compression glove.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal orthotic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve orthotic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.

• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Spinal Orthotics I:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 513

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Orthotic theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design. Describe and compare temporospatial and kinematics characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate orthotic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of orthotic components.
• Formulate appropriate orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

DETAIL COURSE OUTLINE

Motion of spine

- Motion of the cervical spine: atlanto – occipital joint, atlanto – axial joint.
- Remainder of the cervical spine (C2-C7): flexion – extension, lateral flexion and rotation.
- Motion of lumbar spine.

Flexible spinal orthoses (corsets and belts)

- Sacroiliac belt, sacroiliac corset, sacroiliac corset, lumbosacral corset, thoracolumbosacral corset.

Components of rigid spinal orthoses

- Pelvic band: alignment and location, material and dimensions.
- Thoracic band: alignment and location, material and dimensions.
- Anterior extensions of thoracic band with subclavicular pads (cowhorns): alignment and location, material and dimensions.

- Lumbosacral and thoracolumbosacral posterior uprights: alignment and location, material and dimensions.
- Lateral uprights: alignment and location, material and dimensions.
- Oblique lateral uprights: alignment and location, material and dimensions.
- Interscapular band: alignment and location, material and dimensions.
- Full – front abdominal support: superior border, lateral borders, pelvic straps, waist straps, thoracic straps, additional fourth strap.
- Corset front

Design and functions of rigid spinal orthoses

- Lumbosacral flexion – extension control orthosis (chairback): functions, special considerations.
- Lumbosacral flexion – extension - lateral control orthosis (knight): functions control.
- Lumbosacral extension lateral control orthosis (Williams): functions control.
- Thoracolumbosacral flexion – extension control orthosis (Taylor): functions control.
- Thoracolumbosacral flexion – extension - lateral control orthosis (knight – Taylor): functions control.
- Thoracolumbosacral flexion – extension – lateral - rotary control orthosis (cow horn): functions control.
- Thoracolumbosacral flexion control orthosis (anterior hyperextension): functions, control, special considerations.
- Thoracolumbosacral orthosis (plastic body jacket): functions, control, special consideration.

Cervical orthoses

- Flexion – extension control orthoses: special consideration, control, Philadelphia collar (function).
- Flexion – extension and rotary control orthoses: sterno – occipital – mandibular – immobilizer (somi), function.
- Flexion – extension – lateral – rotary control: post appliances (function, control), custom molded (Halo type).

Indications of spinal orthoses

- Positive effects: trunk support, motion control, spinal realignment.
- Negative effect
- Orthotic treatment of lumber and thoracic conditions: mechanical – structural low back pain.
- Orthosis and spinal surgery: pre operative, following surgical lumber fusion, disc surgery without fusion.
- Fractures: osteoporosis with multiple vertebral compression fractures, fracture with posterior element involvement.
- Inflammatory spinal arthritis: juvenile spinal osteochondrosis (kyphosis dorsalis juvenilis, sheuermann, s disease), infectious disorders of spine (osteomylitis and tuber closis), tumor of spine.
- Paralytic disorders : paraplegia, spina bifida
- Spondylolisthesis: congenital (developmental), degenerative.
- Cervical conditions: sprains of the cervical spine, torticollis, degenerative disc disease, fractures and dislocations

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal orthotic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve orthotic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Lower Limb Orthotics I:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 515

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Orthotic theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design. Describe and compare temporospatial and kinematics characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate orthotic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of orthotic components.
• Formulate appropriate orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

DETAIL COURSE OUTLINE

- **Prosthetics and orthotics clinical management**
- **Normal gait**
  - Definition, gait cycle,
  - Components of gait cycle: swing phase, stance phase, stride length, step length, candance, single support, double support.
  - Path of centre of gravity: vertical displacement, lateral displacement.
  - Gait influencing path of centre of gravity: pelvic dip, pelvic rotation, width of walking base.
  - Kinetics and kinematics (analysis of motion) in sagittal plane, frontal plane, transverse plane.
- **Pathomechanics of foot**
  - Introduction, arch and beam mechanism, the axis of motion of the ankle.
  - Simple deformities: eqinus, calcaneus, valgus, varus, cavus.
  - Compound deformities: talipes equinovarus, pes valgoplanus.

- Effect of motor loss on balance and walking: aneroposterior balance, mediolateral balance.
- Effect of paralysis of specific muscles: the tibialis anterior, the gastrosoleus, the peroneus longus, the tibialis posterior.
- Definitions of terms related to movements of the foot and ankle: axis, dorsiflexion, planter flexion, abduction, adduction, supination, pronation, inversion, and eversion.

- **Pathomechanics of the knee**
  - Introduction
  - Bio mechanical consideration: length of lever arms, muscle forces applied to the knee joint, alignment of the femur and tibia, orientation of joint axes, stresses in the femur.
  - Angular deformities involving the knee joint: genu varum, genu valgum, genu recurvatum.
  - Effect of muscle paralysis on standing balance and walking: quadriceps hamstrings.
- **Pathomechanics of the hip**
  - Introduction
  - Load distribution on hip: normal standing, one legged standing and walking.
  - Reduction of forces: gait deviation, canes and crutches.
  - Coxa vara and coxa valga
  - Muscular insufficiency: hip extensors, hip abductors.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal orthotic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.

• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve orthotic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Upper Limb Prosthetics I:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 519

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Prosthetic Science course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require prosthetic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Prosthetics theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design.
• Describe and compare temporospatial and kinematic characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate prosthetic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of prosthetic components.
• Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the prosthetist.

DETAIL COURSE OUTLINE

- **Psychological aspects of amputation**
  - Introduction
  - The Amputation experience: physical capacities (functional limitations, functional failure). Comfort (pain related to prosthetic wear, phantom pain, fatigue). Appearance (visual considerations, auditory considerations). Vocational and economic factors. Social considerations,
  - Amputee behavior: Behavior during hospitalization, long term behavior, behavior related to prosthetic wear.
  - Amputee psychodynamics: Perception of disability, consequences of frustration.

- Psychological rehabilitation, Criteria of successful rehabilitation

- **Components of upper limb prostheses**
  - Terminal devices: hooks, hands.
  - Wrist units, below – elbow components: B/E hinges, cuffs, pads, B/E harness and controls, elbow unit, above - elbow components: elbow units, a/e harness and control.
  - Shoulder prosthesis: shoulder harness and control cables.
  - Externally powered prosthesis, Endoskeletal prosthesis.
- **Components for juvenile upper – limb amputees**
  - Terminal devices
  - Shoulder prosthesis, Above - elbow components
  - Below – elbow components, Wrist units
- **Fabrication, fitting and harness and procedure**
  - Below elbow prosthesis: socket and fore arm extension (making and measurement, primary cast, master mold, check socket, lamination mold and first lamination, extension second lamination and socket trim).
  - Harness and control systems: unilateral below elbow harness, unilateral below elbow chest strap harness with shoulder saddle, Muenster below elbow harness, bilateral below elbow harness, above knee prosthesis: measurement and fabrication.
  - Harness and control system: unilateral above elbow harness, unilateral above elbow chest strap harness with shoulder saddle, bilateral above elbow harness.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal prosthetic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.

• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve prosthetic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Lower Limb Prosthetics I:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 521

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Prosthetic Science course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require prosthetic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Prosthetics theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design.
• Describe and compare temporospatial and kinematic characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate prosthetic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of prosthetic components.
• Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the prosthetist.

DETAIL COURSE OUTLINE

- **Psychological aspects of amputation**
  - Introduction
  - The Amputation experience: physical capacities (functional limitations, functional failure). Comfort (pain related to prosthetic wear, phantom pain, fatigue). Appearance (visual considerations, auditory considerations). Vocational and economic factors. Social considerations,
  - Amputee behavior: Behavior during hospitalization, long term behavior, behavior related to prosthetic wear.
  - Amputee psychodynamics: Perception of disability, consequences of frustration.
  - Psychological rehabilitation.

- Criteria of successful rehabilitation

- **Levels of amputation and limiting factor**
  - The below knee amputation
  - Selection of patient: peripheral vascular disease,
- **The below knee amputation**
- **Immediate and early prosthetic management**
- **Normal gait**
  - Definition, gait cycle,
  - Components of gait cycle: swing phase, stance phase, stride length, step length, candance, single support, double support.
  - Path of centre of gravity: vertical displacement, lateral displacement.
  - Gait influencing path of centre of gravity: pelvic dip, pelvic rotation, width of walking base.
  - Kinetics and kinematics (analysis of motion) in sagittal plane, frontal plane, transverse plane.
- **Below – Knee prostheses and components**
  - Foot – ankle assembly: single – axis foot – ankle assembly, SACH foot – ankle assembly, multiple - axis foot – ankle assembly.
  - Shank
  - Socket: patellar tendon bearing socket, air cushion socket, other socket variations.
  - Suspension systems: cuff suspension, supracondylar system, supracondylar/suprapetellar system, thigh corset, rotator unit, modular construction.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

•Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
•Formulate an optimal prosthetic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
•Communicate and discuss patient goals and expectations and discuss and debate the prosthetic management with the patient, co-workers and other members of the rehabilitation team.
•Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
•Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
•Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
•Fit the device to the patient using static and dynamic functional criteria established from the original assessment.

•Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
•Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
•Assess and solve prosthetic problems as part of long term patient care.
•Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
•Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
•Educate the client and/or caregiver on use, care and function of the device.
•Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Biomechanics I:

CREDIT HOURS 3 (3-0)

Course Code: BOP- 525

Course Description:

The understanding of Bio-mechanical principles of Prosthetics and Orthotics will be the foundation of the work of the students. It's essential to have a sound theoretical knowledge of the subject and students are able to demonstrate the rigorous application of these principles to practical P&O situations and in the analysis of those situations.

The student should be able to meet the following learning objectives:

• Demonstrate an ability to apply principles of tissue mechanics to explain the principles of P&O treatment, (involving various force systems) and the practical problems encountered in prosthetics and orthotics
• Use biomechanical terminology to describe position and motion of the human body
• Discuss mechanical principles governing human motion
• Utilise temporospatial, kinematic and kinetic information to distinguish between normal and abnormal function of the upper limbs, lower limbs & Spine.
• Analyse the forces at a skeletal joint for various static and dynamic activities
• Demonstrate the ability to analyzer forces and moments applied to the body by prosthetic and orthotic devices.

• Apply biomechanical principles to generate optimal solutions to clinical problems in prosthetics and orthotics.
• understand the concepts of differentiation and integration and evaluate derivatives and integrals of a function.

DETAIL COURSE OUTLINE

- **What Is Biomechanics?**
- **Kinematic Concepts for Analyzing Human Motion**
- **Kinetic Concepts for Analyzing Human Motion**
- **Biomechanics of bone:**
  - Introduction; bone composition and structure; biomechanical properties of bone; biomechanical behavior of bone; bone remodeling; degenerative changes in bone associated with aging;
- **Biomechanics of articular surface:**
  - Introduction; composition and structure of articular cartilage; biomechanical behavior of articular cartilage; lubrication of articular cartilage; wear of articular cartilage; biomechanics of cartilage degeneration;
- **Biomechanics of tendons and ligaments:**
  - Introduction; composition and structure of tendon and ligaments; mechanical behavior of tendons and ligament; factors that affect the biomechanical properties of tendons and ligaments;

- **Biomechanics of peripheral nerves and spinal nerve roots:**

- Introduction; anatomy and physiology of peripheral nerves; anatomy and physiology of spinal nerve roots; biomechanical behavior of peripheral nerves; biomechanical behavior of spinal nerve roots;

- **Biomechanics of skeletal muscles:**
  - Introduction; composition and structure of muscle contraction; mechanics of muscle contraction; force production in muscles; muscle fiber differentiation; muscle injuries, muscle remodeling;

6th semester

Upper Limb Orthotics II:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 512

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Orthotic theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design. Describe and compare temporospatial and kinematics characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate orthotic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of orthotic components.
• Formulate appropriate orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

DETAIL COURSE OUTLINE

- **Elbow problems:**
  Epicondylitis (lateral Epicondylitis- tennis elbow, medial Epicondylitis) Arthritis (osteoarthritis, rheumatoid arthritis) Disarticulation, paralysis.
- **Elbow orthoses:**
  Dynamic elbow orthosis, elbow joint, 3- point elbow extension orthosis, anterior elbow orthosis, static elbow orthosis(with side steels, elasticized)

- **Shoulder problems:**

Shoulder dislocation, burns and other scars, paralysis, muscular dystrophies, ERB'S palsy, axillary neuropathy, rotator cuff rupture, anterior thoracic neuropathy.

- **Shoulder orthoses:**
  Slings, overhead supports. Clavicle stabilizer orthosis, shoulder abduction orthosis, Stanmore flail arm orthosis, roehanpton flail arm orthosis, balanced forearm orthosis.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal orthotic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve orthotic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Spinal Orthotics II:

CREDIT HOURS 3 (2-1)
Course Code: BOP- 514

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Orthotic theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design. Describe and compare temporospatial and kinematics characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate orthotic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of orthotic components.
• Formulate appropriate orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

DETAIL COURSE OUTLINE

- **Orthotic treatment of scoliosis**
  - Definitions
  - Types of scoliosis: idiopathic, neuromuscular, congenital, associated with skeletal abnormalities, associated with neurofibromatosis, mesenchymal disorder, trauma, secondary to irritation, other such as metabolic, nutritional and endocrine disorders.
  - General considerations
  - Methods of achieving correction
  - Purpose of orthoses
  - Types of orthoses: CTLS alignment orthosis (Milwaukee orthosis), TLS alignment orthoses, plaster casts

- **The CTLS alignment orthosis (Milwaukee)**
  - General description
  - Pelvic girdle: functions, trimlines.
  - Head and neck unit: functions, neck ring, throat piece, occipital pads.
  - Uprights: functions, anterior upright, posterior uprights.
  - Corrective pads and accessories: out rigger, thoracic pad and straps, lumber pad, axillary sling and straps, shoulder ring and straps, Kypos pads.
- **Checkout of CTLS alignment orthosis**
- **TLS alignment orthoses**
  - Boston orthosis: general considerations, specific features (materials, trimlines, pads, sizes).
  - Miami orthosis: general consideration, specific features (materials, trimlines, pads).
  - Wilmington orthosis: general consideration, specific features (materials, trimlines, pads).
  - New York orthopedic hospital orthosis: general consideration, specific features (materials, trimlines, pads).

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal orthotic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.

• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve orthotic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Lower Limb Orthotics II:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 516

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Orthotic theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design. Describe and compare temporospatial and kinematics characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate orthotic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of orthotic components.
• Formulate appropriate orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

DETAIL COURSE OUTLINE

- **Principles or orthotic management**
  - Goals and methods of treatment,
  - Function of orthoses: stabilizing or supportive, the motorized or functional, corrective orthoses, protective orthosis.
  - Hazards and errors in bracing.
- **Shoes**
  - Parts of shoes: sole, heel, upper, linings and reinforcements, shoe lasts, quarter heights, throat styles, closures.
  - Construction, extra depth and molded shoes.
  - Evaluation of fit.
- **Shoe modifications and foot orthoses**
  - General characteristics.

- External shoe modifications: heel modifications, heel flare, heel wedge, extended (Thomas) heel, heel elevation.
- Sole modification: rocker bar, metatarsal bar, sole wedge, sole flare, steel sole bar.
- Combination heel and sole modifications.
- Internal sole modifications
- Heel modifications: heel-cushion relief, medial heel wedge, interior laced ankle support.
- Sole modifications: metatarsal pad, inner sole excavation, medial longitudinal arch support (scaphoid pad, navicular pad, cookie), toe crust.
- Foot orthoses (inserts inlays): UCBL insert, heel seat (heel cup), sesamoid platform.
- Prescription principles: ankle subtalar joints, mid and hind foot, fore foot, fractures, leg length discrepancy.
- Evaluation.

- **Ankle, knee and hip orthosis**
  - Ankle-foot components and orthoses (AFO's)
  - Metal and metal – plastic designs: shoe or foot attachments (stirrup, caliper, shoe insert, ankle stops), ankle – joint assists (varus valgus corrections (t – straps), uprights, calf bands and cuffs.
  - Plastic design: posterior leaf spring, spiral, hemi spiral, solid ankle, AFO with flange.
  - Knee – ankle – foot components and orthoses (KAFO's):
  - Metal design (knee joint and lock): the free motion knee joint, offset knee joint. Drop ring lock, pawl lock, adjustable knee lock.
  - accessories pad and straps
  - plastic design and plastic – metal design
  - hip – knee – ankle – foot components and orthoses (HKAFO's)
  - Hip joints and locks: single axis locks, double axis lock.
  - Pelvic bands: unilateral pelvic band, double or pelvis girdle band, Silesian belt.
  - Spinal attachments: thoracis bands, uprights, abdominal support, Lumbosacral flexion extension and lateral control orthoses ("Knight"), Thoracolumbosacral flexion extension and lateral control orthoses ("Knight – Taylor").
  - Knee orthoses: for Patello – femoral disorder, angular motion control in frontal and sagittal planes (Swedish knee cage, three way knee stabilizer). Axial rotation control,
  - Special purpose orthoses: weight bearing devices (Patellar-tendon-bearing orthosis, Patten bottom)
  - fracture orthosis: tibial orthosis, femoral orthoses.
  - Special purpose orthoses for children: Angular and rotational deformities (Denis Browne splint, "A"-Frame orthosis, Torsion-Shaft orthosis, Hip Rotation control straps.)
  - Congenital Hip dislocation and dysplasia: Von Rosen splint, Ilfeld splint, Pevlik Harness.
  - Legg-Calve-Perthesis disease: Trilateral orthosis, Toronto orthosis, Scottish Rite orthosis.
  - Severe Paralytic Disorders: Detachable hip joint, standing frame orthosis, Parapodium, Reciprocation – Gait orthosis.

- **Princples of fit and alignment**
    - Joint characteristics related to orthotic fit and alignment: Hip joint, knee joint, ankle joint and the line of progression, subtalar joint.
    - Alignment in frontal plane.
    - Alignment in transverse plane.
    - Effects of incorrect Orthotic alignment: in frontal plane, in sagittal plane in transverse plane.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal orthotic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve orthotic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Upper Limb Prosthetics II:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 520

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Prosthetic Science course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require prosthetic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Prosthetics theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design.
• Describe and compare temporospatial and kinematic characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate prosthetic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of prosthetic components.
• Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the prosthetist.

DETAIL COURSE OUTLINE

- **Below elbow prostheses**
- **Above elbow prostheses**
- **Amputee training**
  - Importance of residual function principles of amputee training: some factors which affect learning, problem of harness, methods of determining when amputee is trained, and requirement of trainer.
  - Amputee orientation prior to control training.
  - Control training for bilateral amputee.
  - Criteria for completion of control training.

- **Controls and use training for child amputee**
- **Medical considerations**
  - Preparation of the patient for amputations
  - Sites of amputation
  - Amputation surgery: the close flap or plastic amputation, techniques of the open circular amputation.
  - Post operative care of the stump
  - Post operative physical therapy
  - Immediate fitting procedures.
  - Stump hygiene
  - Stump pathology
  - Role of the surgeon in the prosthetic team.
- **Prosthetic prescription**
  - Medical and social factors
  - Vocational and avocational consideration
  - Prosthetic specification
  - Prescription of mechanical component.
  - Responsibilities of the member of prescription team.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal prosthetic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.

• Assess and solve prosthetic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Lower Limb Prosthetics II:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 522

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Prosthetic Science course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require prosthetic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Prosthetics theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design.
• Describe and compare temporospatial and kinematic characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate prosthetic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of prosthetic components.
• Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the prosthetist.

DETAIL COURSE OUTLINE

- **Fabrication, fitting, alignment and suspension of the above knee prosthesis**
  - Principles: ischial – gluteal weight – bearing and the a – p dimension, high anterior wall and the scapa's pad, control of perimeter at ischial level, adduction angle, flexion angle.
  - Fabrication procedures: patient evaluation, measurement and molding (stump flexion angle, stump adduction angle, a – p dimension, stump perimeters.
  - Cast modification.
  - Socket lamination and trim.
  - Bench alignment.

- Suspension.
- Static and dynamic alignment, alignment duplication, shaping and final lamination.

- **Biomechanics of below – knee prosthesis**
  - Pressure as a determinant of comfort.
  - Socket contours and shape related to pressure distribution.
  - Accommodating for differences in relative firmness.
  - Accommodating for different tolerance to pressure.
  - Effect of relative inclination of supporting surface.
  - Alignment and pressure distribution.
  - Stump length related to pressure on stump.
  - Mediolateral alignment.
  - Anteroposterior alignment.
  - Suspension methods and stump – socket pressures.
- **Fabrication, fitting, alignment, and suspension of the below – knee prosthesis**
  - Evaluation of stump, measurement and molding, cast modification, fabrication of the soft insert, socket lamination and trim, bench alignment. Suspension, static and dynamic alignment, alignment duplication.
  - Variation of the patellar – tendon – bearing prosthesis
- **Gait analysis of the below – knee amputee**
  - Between heel strike mid – stance.
  - At mid – stance.
  - Between mid – stance and toe – off.
  - During swing phase.
- **Above – knee prosthesis and components**
  - Foot ankle assembly.
  - Shank.
  - Knee assembly.
  - Knee axis: polycentric axis.
  - Knee control: constant friction, variable friction, weight – activated, friction brake, manual lock.
  - Extension aids: kick strap, extension lever.
  - Hydraulic and pneumatic systems: sockets.
  - Plug fit.
  - Quadrilateral.
  - Total contact.
  - Non – total contact.
  - Suspension devices: suction suspension, partial suction with auxiliary suspension, sileasian bandage, pelvic belt, special devices.
  - Modular construction.
  - Prosthesis maintenance.

- **Fluid – controlled prosthesis**
  - General characteristics: variable resistance during swing, extension bias.

- Special features: coordinated knee – ankle motion, stance control, knee disarticulation.
- Prescription consideration.

- **Biomechanics of above knee prosthesis**
  - General considerations.
  - Socket consideration: posterior wall, anterior wall, lateral wall, medial wall.
  - Initial flexion
  - Alignment: mediolateral alignment, antroposterior alignment.
  - Swing – phase control.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal prosthetic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve prosthetic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Biomechanics II:

CREDIT HOURS 3 (3-0)

Course Code: BOP- 526

Course Description:

The understanding of Bio-mechanical principles of Prosthetics and Orthotics will be the foundation of the work of the students. It's essential to have a sound theoretical knowledge of the subject and students are able to demonstrate the rigorous application of these principles to practical P&O situations and in the analysis of those situations.

The student should be able to meet the following learning objectives:

• Demonstrate an ability to apply principles of tissue mechanics to explain the principles of P&O treatment, (involving various force systems) and the practical problems encountered in prosthetics and orthotics
• Use biomechanical terminology to describe position and motion of the human body
• Discuss mechanical principles governing human motion
• Utilize temporospatial, kinematic and kinetic information to distinguish between normal and abnormal function of the upper limbs, lower limbs & Spine.
• Analyze the forces at a skeletal joint for various static and dynamic activities
• Demonstrate the ability to analyzer forces and moments applied to the body by prosthetic and orthotic devices.

• Apply biomechanical principles to generate optimal solutions to clinical problems in prosthetics and orthotics.
• understand the concepts of differentiation and integration and evaluate derivatives and integrals of a function.

DETAIL COURSE OUTLINE

- **Linear Kinematics of Human Movement**
- **Linear Kinetics of Human Movement**
- **Equilibrium and Human Movement**
- **Biomechanics of the knee:**
  - Introduction; kinematics; kinetics
- **Biomechanics of the hip:**
  - Introduction; anatomical consideration; kinematics; kinetics;
- **Biomechanics of the foot and the ankle:**
  - Introduction; growth of foot; kinetics of the foot; ankle joint biomechanics; kinetics of ankle joint; effects of shoe wear on biomechanics of foot/ankle;
- **Biomechanics of lumbar spine:**
  - Introduction; the motion segment-the functional unit of the spine; kinematics; kinetics

- **Biomechanics of the cervical spine:**

- Introduction; component anatomy and biomechanics; kinematics; applied biomechanics; biomechanics of cervical trauma;

- **Biomechanics of the shoulder:**
  - Introduction; kinematics and anatomy; kinetics;
- **Biomechanics of the elbow:**
  - Introduction; anatomy; kinematics; carrying angle; elbow stability; kinetics; electromyography; elbow joint forces; articular surface forces; calculation of joint reaction force at the elbow;
- **Biomechanics of the wrist:**
  - Introduction; anatomy of the wrist and hand; control of the wrist and the hand; kinematics; interaction of wrist and hand motion, pattern of prehensile hand function;

4th YEAR
7th semester
Lower Limb Orthosis III:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 517

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Orthotic theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design. Describe and compare temporospatial and kinematics characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate orthotic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of orthotic components.
• Formulate appropriate orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

DETAIL COURSE OUTLINE

- **Analysis of pathological gait**
  - Introduction.
  - Gait deviations (under consideration of points like phase of gait, Description, how to observe, possible causes): Lateral trunk bending, Hip hiking, Internal and external limb rotation, Circumduction, Abnormal walking base, Excessive medial or lateral foot contact, Anterior trunk bending, Posterior trunk bending, lordosis, Hyperextended knee, Exessive knee flexion, Exessive genu varum or

valgam, Inadequate dorsiflexion control, Insufficient push-off, Vaulting, Rythmic distribances, Other, including abnormal arm motion.
    - Common functional disorders: spastic hemiplegia, flaccid paralysis of quadriceps, arthritis of knee.
- **Orthotics in lower motor neuron disorders**
    - Deformities (functional/fixed)
    - Ankle and foot: muscles functional deficit, deformities and prescription considerations.
    - Knee: muscles functional deficit, deformities and prescription considerations.
    - Hip: muscles functional deficit, deformities and prescription considerations.
- **Functional consideration in spinal cord injury**
- **Orthotics in upper motor neuron disorders**
    - Neuropathology of UMN disorders
    - Recovery processes
- **Orthotic in other clinical conditions**
    - Orthotics in arthritis
    - Orthotics in fractures
    - Orthotics in hemophilia
    - Orthotics in progressive muscular dystrophy

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal orthotic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.

• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve orthotic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Lower limb prosthesis III:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 523

Theory:

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Prosthetic Science course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

The student should be able to meet the following learning objectives:

• Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
• Recognize and describe the signs and symptoms of the most common pathologies which require prosthetic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
• Demonstrate empathy between Prosthetics theory and the environment in which the client is situated.
• Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design.
• Describe and compare temporospatial and kinematic characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
• Discuss biomechanical force systems and use these principles in generating an appropriate prosthetic prescription.
• Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
• Compare and contrast the functional characteristics of prosthetic components.
• Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
• Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the prosthetist.

DETAIL COURSE OUTLINE

- **Gait analysis of the above knee amputee**
  - Deviations: abducted gait, lateral bending of trunk, circumduction, swing phase whips, rotation of foot on heel strike, un even heel rise, terminal swing impact, footslap, uneven length of steps, lumbar lordosis and vaulting.
- **Partial foot, syme, knee disarticulation and bilateral prosthesis**
  - Partial foot prosthesis
  - Symes prosthesis
  - Knee diarticulation prosthesis
  - Bilateral prosthesis
  - Bilateral above knee, Above knee/below knee

- Bilateral below knee

- **Hip disarticulation prostheses**
  - Socket designs: basic socket, diagonal socket, hemipelvectomy socket.
  - Stump – socket control: anteroposterior control, mediolateral control.
  - Alignment: stability in sagittal plane, stability in frontal plane.
  - Gait sequence: heel strike, foot flat, midstance, and push off, acceleration, decelaration.
  - The modular approach.
- **Gait and activities training**
  - Introduction
  - Prosthetic training for below knee or above knee: applying the prosthesis correctly, balancing on the prosthesis, walking on level surfaces, sitting and raising from chairs, ascending and descending stairs, ascending and descending inclines, picking up objects from floor, clearing obstacles, hop – shop method of running, self protection in falling.
- **Functional capacities**
  - Amputation below ankle, below knee amputations.
  - Above knee amputation, hip disarticulation.
  - Bilateral amputation.

Practical:

Course Description:

This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

The student should be able to meet the following learning objectives:

• Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
• Formulate an optimal prosthetic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
• Communicate and discuss patient goals and expectations and discuss and debate the prosthetic management with the patient, co-workers and other members of the rehabilitation team.
• Reliably measure and capture a positive cast or image of clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
• Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
• Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
• Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
• Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.

• Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
• Assess and solve prosthetic problems as part of long term patient care.
• Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
• Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
• Educate the client and/or caregiver on use, care and function of the device.
• Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

Biomechanics III:

CREDIT HOURS 3 (2-1)

Course Code: BOP- 527

Course Description:

The understanding of Bio-mechanical principles of Prosthetics and Orthotics will be the foundation of the work of the students. It's essential to have a sound theoretical knowledge of the subject and students are able to demonstrate the rigorous application of these principles to practical P&O situations and in the analysis of those situations.

The student should be able to meet the following learning objectives:

• Demonstrate an ability to apply principles of tissue mechanics to explain the principles of P&O treatment, (involving various force systems) and the practical problems encountered in prosthetics and orthotics
• Use biomechanical terminology to describe position and motion of the human body
• Discuss mechanical principles governing human motion
• Utilize temporospatial, kinematic and kinetic information to distinguish between normal and abnormal function of the upper limbs, lower limbs & Spine.
• Analyze the forces at a skeletal joint for various static and dynamic activities
• Demonstrate the ability to analyzer forces and moments applied to the body by prosthetic and orthotic devices.

• Apply biomechanical principles to generate optimal solutions to clinical problems in prosthetics and orthotics.
• understand the concepts of differentiation and integration and evaluate derivatives and integrals of a function.

DETAIL COURSE OUTLINE

- **Angular Kinematics of Human Movement**
- **Angular Kinetics of Human Movement**
- **Human Movement in a Fluid Medium**
- **Introduction to the biomechanics of fracture fixation:**
  - Introduction; fracture stability and healing; fixation devices and methods;
- **Biomechanics of arthroplasty:**
  - Introduction; forces at the hip joint; rotational moments about the implant, reconstructed joint geometry; stem position within the femoral canal; periprosthetic bone loss; forces at the knee joint; medial-lateral load distribution; patellofemoral joint and loads; joint line height; posterior cruciate ligament; conformity; constraint; polyethylene; anterior cruciate ligament;
- **Engineering Approaches to standing, sitting and lying:**

- Biomechanics of standing; reaching; biomechanics of pelvis; flat versus ball and socket joint; sitting; seat; lying; decubitus ulcers

- **Biomechanics of gait:**
  - Introduction; anatomical consideration; methods of gait analysis; gait cycle; time-distance variables; angular kinematics; segmental kinetics; muscular control;

Practical:

- Goniometry of upper limb
- Goniometry of lower limb
- Goniometry of spine
- Gait deviation

Workshop Practices I:

CREDIT HOURS 3 (0-3)

Course Code: BOP- 601

Course description:

The student will have experience in the clinical environment of supplying prostheses and orthoses to patients undergoing treatment. This experience should cover as wide a range as possible but with emphasis on the major levels of provision.

The student should be able to meet the following learning objectives:

They will develop skills in the:
• Communication
• Assessment and prescription;
• Clinical provision of prostheses and orthoses;
• Manufacture of prostheses and orthoses;
• Interpersonal relationships;
• Organization and management;
• Clinical research.
• Contributing too and learning from the clinic team.

DETAIL COURSE OUTLINE

- Practice in upper limb & lower limb orthoses I
- Practice in upper limb & lower limb prostheses I
- Practice in spinal orthosis I

Research Methodology:

CREDIT HOURS 3 (3-0)

Course Code: DPT- 657

Course description

The student would acquire the knowledge of the research problem, design, Sampling, data collection, analysis of data, Testing hypotheses, interpretation and report writing to prosthetics and Orthotics

The student should be able to meet the following learning objectives:

• Explain the process, types, design, needs, and principles of research
• Formulate an appropriate research plan in order to solve a clinical problem
• Examine the concepts of estimation and hypothesis testing with applications to population proportions, means, and variances
• Describe the sampling, data collection and processing of data
• Examine the data by using different measures
• Perform effective descriptive statistical analysis as well as statistical inference for a variety of mainstream applications
• Use appropriate empirical and probability distributions to model data.
• Conduct a basic research study in order to solve a clinical problem

DETAIL COURSE OUTLINE

- Introduction to Research methodology: Meaning of research, objectives of research, Types of research & research approaches,
- Research problem: Statement of research problem Statement of purpose and objectives of research problem, Necessity of defining the problem
- Research design: Meaning of research design, Need for research design,
- Sampling Design: Criteria for selecting sampling procedure
- Measurement & scaling techniques: Measurement in research- Measurement scales, sources of error in measurement,
- Methods of data collection: collection of primary data.
- Sampling fundamentals, need for sampling
- Analysis of data: Types of analysis.
- Testing of hypothesis: What is hypothesis? Basic concepts concerning testing of hypothesis.

Clinic, Workshop and Business Management:

CREDIT HOURS 2 (2-0)

Course Code: BMS- 410

Course description:

Students would have an understanding of the planning, construction, human management, store management and safety of the workshop

The student should be able to meet the following learning objectives:

• **Explain** techniques related to the design, planning, control and improvement of service and manufacturing operations.
• Demonstrate basic knowledge of financial management practices such as cost calculations and accounting processes.
• Address issues related to clinic management including, appointment systems and record keeping.
• Discuss the importance of quality control and workflow management.
• Apply appropriate inventory management protocols
• Understand and discuss the benefits associate with the use of quality assurance systems
• Understand the organization of the workplace environment.

DETAIL COURSE OUTLINE

- materials acquisition, handling and stock control;
- workforce management;
- production cost calculations;
- budgeting, invoicing, receipting and accounting;
- clinic management, appointment systems, record keeping;
- property management, care and maintenance;
- environmental/ecological considerations;
- quality management;
- health systems;
- ethical considerations

8th semester

Fundamentals of Electricity and Electronics:

CREDIT HOURS 3 (3-0)

Course Code: ELT- 321

Course Description:

The student will have knowledge of basic principles of electricity and electronics with particular reference to applications in prosthetics, orthotics and workshop practice.

The student should be able to meet the following learning objectives:

• **Explain** basic concept of electricity and electronics covering following:
DC circuits, inductance and capacitance, ACcircuits, power, supplies, amplifiers, feedback, interference rejection techniques, myoelectrodes and bioelectricity
• Explain electronics measuring system
• Explain safety practice of electricity

DETAIL COURSE OUTLINE

Electricity

- **Basic Concepts:**
  - Introduction to SI System of units, charge, current, resistance, potential differences, electromotive force, Energy power, Voltage and current Relationship, energy storage, DC circuits, AC circuits, sine wave, Frequency, Period, phase, RMS value, inductive and capacitive reactance.
- **Resistors:**
  - Resistors sensitive to temperature, strain and light, Resistors in series and in parallel.
- **Transformers:**
  - Principle of the transformer, voltage, turns and current ratios.
- **Semi Conductors:**
  - Outline Concepts of semiconductors and insulators. Conduction in intrinsic and extrinsic semi-conductors.
- **Amplifiers:**
  - Amplifiers as a system element. Operational amplifiers and their ideal characteristics. The small single equivalent circuit having a controlled source. Voltage and current gain, the decibel power gain, Noise and drift voltages, Source in amplifiers and bio-systems.
- **Feed Back:**
  - The general Feedback equation, Feedback Voltage series, negative feedback and loop gain, loop gain Accuracy, input resistance, output resistance, band width of noise. Feedback as a control mechanism in the wider sense, Positive feedback – instability and self-oscillation in amplifiers and oscillators.
- **Measurements:**
  - Electronics measuring instruments. Summary of recording instruments. Concepts of resolution and accuracy applied to digital and analogue instruments. Transducers for temperature, light, pressure, sounds, description, specification and use in circuit.

- **Myoelectrodes:**
  - Technology of metal and metal paste electrodes, the equivalent circuit between electrodes, stability, source of unwanted voltage electrode systems. Other types of myoelectrodes micro electrodes, implanted electrodes, comparison with surface electrodes. Sensors, microprocessors etc.
- **Electrical Safety:**
  - Description of single phase and three phase supply system and voltage involved. Function of line, natural and earth in single phase system. Current practice in pin connection and color codes. Simple safety procedure to be taken when servicing equipment. Effect on safety of fault conditions. Fuses, Conductors and earth leakage detectors – miniature circuit breakers (MCB). Voltage regulators integrated circuits.
- **Bio-Electricity**:
  - Biological Potentials, Muscle action potentials, Electro-myography and Myo-electricity

CAD-CAM Technology:

CREDIT HOURS 3 (2-1)

Course Code: CIT- 639

Course description

Student will acquire computer knowledge to design the prosthetics and orthotics components and apply in research and development in prosthetics and orthotics field.

The student should be able to meet the following learning objectives:

• Describe the advanced application of computer in prosthetics and orthotics field.
• Design various components for prosthetics and orthotics use.
• Make use of computer knowledge in the statistics data analysis and Documentation.
• Describe the principles of computer aided design (CAD) & computer aided Manufacture (CAM)

DETAIL COURSE OUTLINE

CAD-CAM TECHINIQUES FOR ORTHOTICS AND PROSTHETICS

- **Basics of CAD:**
  - Introduction, Definition, History, Current status, Product Cycle, Automation, Designing, Application and Benefits. Computer Graphics:
  - Introduction of software, Function of graphic package, Application Software. AutoCAD 2010 and updated version:
  - Introduction, Foundation of AutoCAD Commands, Execution of Simple 2D Drawings, Understanding 3D commands, Executing3D Commands, Creating 3D objects Rendering and Image attach to an object Starting New Projects, Creating, Editing, Saving Drawing,
  - Annotation, Dimension, Plotting, Customization, Auto Lisp. Introduction to CNC,
  - History of CNC, Advantages and disadvantages of N/C, CNC, DNC, Major part of CNC.
  - Basics of CAM: Introduction of CNC machine, basics of Computer Aided Designing and Manufacturing (CADCAM) and its use in P&O.
  - Other kinds of Computer use in Prosthetics and Orthotics. CADCAM Technology in socket making and also making of different kinds of orthosis and prosthesis.
  - CAD/CAM in Prosthetics & Orthotics: types of digitizers used, concept of different types of modifying software
  - CNC carver and its specification, step wise fabrication procedure of sockets, shells and spinal orthoses, its advantages and disadvantages

Practical:

1. Trainees have to be thorough in all branches of MS Office especially WORD and POWERPOINT. In addition to that it would be better if trainee also learn one additional drawing and imaging software among e.g. Corel Draw, PageMaker, Photoshop or similar

kind of software.
2. Trainees has to be thorough in all branches CADCAM especially AUTOCAD. Trainees should make design of all common types of P&O components which are regularly in use by using AutoCAD software.

Workshop Practices II:

CREDIT HOURS 4 (0-4)

Course Code: BOP- 602

Course description:

The student will have experience in the clinical environment of supplying prostheses and orthoses to patients undergoing treatment. This experience should cover as wide a range as possible but with emphasis on the major levels of provision.

The student should be able to meet the following learning objectives:

They will develop skills in the:
• Communication
• Assessment and prescription;
• Clinical provision of prostheses and orthoses;
• Manufacture of prostheses and orthoses;
• Interpersonal relationships;
• Organization and management;
• Clinical research.
• Contributing too and learning from the clinic team.

DETAIL COURSE OUTLINE

- Practice in upper limb & lower limb orthoses II
- Practice in upper limb & lower limb prostheses II
- Practice in spinal orthosis II

Research Project:

CREDIT HOURS 6 (0-6)

Course Code: DPT- 681

DETAIL COURSE OUTLINE

Each Trainee shall take a project work under supervision of a guide. Project work has to be well documented and presented in essay form. The major focus will be trainee's original work which she or he has to present prior to final examination. The subject and the guide should be chosen within four weeks from the day of admission to the fourth year.