Kerala University of Health Sciences
Thrissur

SYLLABUS

for

Bachelors of Prosthetics and Orthotics

Four Years Duration (Annual) + 6 months Internship

Course Code:

2024-25 Admission onwards

FIRSTYEAR

Year : 1		
Subject	**Anatomy**	
Code	**BPO 101**	
Teaching Hours : 120	**Theory : 120**	**Practical :**
Total Credits : 04	**Theory : 04**	**Practical paper given separate in Subject Code 151**
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 available prosthetic/orthotic treatment. The student should recognize that biomechanical as well as pathological factors must be viewed concurrently with anatomical factors.	
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.*	
Learning outcomes	● *Develop an understanding of basic terminology* ● *Develop concept on interrelation of various organs and its function in human locomotion* ● *Analyze structure and function of all systems of human body* ● *Develop clear understanding on cell, tissue, organ and systems of Human body* ● *Develop an understanding musculoskeletal system of human body* ● *Apply conception to explain composition, structure and categories of the bones according to their shape* ● *Understand the Principle and function of skeletal system* ● *To gain a more complete understanding of different types of joints and describe the structure of synovial joints*	
Theory (90Hours)	● General Histology, study of the basic tissues of the body; Cell, Epithelium, Connective Tissue, Cartilage, Bone, Muscular tissue, Nerve ● Embryology: Development of bones, axial and appendicular skeleton and muscles ● Regional anatomy: THORAX Cardio–Vascular System ● Mediastinum: Divisions and contents	

	• Pericardium: Thoracic Wall: position, shape and parts of the heart; conducting System; blood Supply and nerve supply of the heart • Respiratory system: Outline of respiratory passages • Pleura and lungs: position, parts, relations, blood supply and nerve supply Diaphragm: Origin, insertion, • nerve supply and action, openings in the diaphragm. • Intercostal muscles and Accessory muscles of respiration: Origin, insertion, nerve supply and action. • Abdomen: Peritoneum: Parietal peritoneum, visceral peritoneum, functions of peritoneum**.** • Location, size, shape, features, blood supply, nerve supply and functions of the following: • stomach, kidney, urinary bladder, intestines • Musculoskeletal Anatomy **:** Anatomical positions of body, axes, planes, common anatomical terminologies • Connective tissue classification • Bones-Composition & functions, classification and types according to morphology and development • Joints-definition-classification, structure of fibrous, cartilaginous joints, blood supply • and nerve supply of joints • Osteology: Clavicles, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges. • Soft parts**:** pectoral region, axilla, cubital fossa, palm, dorsum of hand, muscles, nerves, blood vessels. • Joints: Shoulder girdle, shoulder joint, elbow joints, radioulnar joint, wrist joint and joints of the hand. • Arches of hand, skin of the palm and dorsum of hand. • Osteology**:** Hip bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges. • Soft parts**:** Gluteal region, front and back of the thigh (Femoral triangle, femoral canal and inguinal canal), medial side of the thigh (Adductor canal), lateral side of the thigh, popliteal fossa, anterior and posterior compartment of leg, sole of the foot, lymphatic drainage of lower limb, venous drainage of the lower limb, arterial supply of the lower limb, arches of foot, skin of foot. • Joints: Hip Joint ,Knee joint, Ankle joint, joints of thefoot. • Osteology**:** Cervical, thoracic, lumbar, sacral and coccygeal vertebrae and ribs Soft tissue**:** Pre and Para vertebral muscles, intercostals muscles, anterior abdominal wall muscles, Inter-vertebral disc. • Pelvic girdle and muscles of the pelvic floor • Osteology: Mandible and bones of the skull
Practical	**Practical paper given separate in Subject Code 151**

TEXT BOOKS & JOURNALS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Human Anatomy: Regional and Applied	Chaurasia, B D	CBS, New Delhi	January 2013, reprint 6th edition
2.	Handbook of General Anatomy	Chaurasia, B D	CBS, New Delhi	7th Edition , July 2023
3.	Anatomy: Palpation and Surface Markings	Field, Derek	Butterworth, London	1997
4.	Essentials of Human Osteology	Asim Kumar Datta	Current Books International	1997
5.	Grant's Method of Anatomy A Clinical Problem-solving Approach	John Charles Boileau Grant, John V. Basmajian, Charles E. Slonecker	Williams & Wilkins	2010
6.	Gray's Anatomy for Students	Richard Lee Drake, Wayne Vogl, Adam W. M. Mitchell	Elsevier	2019
7	Last's Anatomy: Regional and Applied	Robert M. H. McMinn MD PhD FRCS(Eng)	Churchill Livingstone;	9th edition (19 September 1994)

Year : 1		
Subject	**Physiology**	
Code	**BPO 102**	
Teaching Hours : 120	**Theory : 90**	**Practical : 30**
Total Credits : 04	**Theory : 03**	**Practical : 01**
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.	
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 (ie: blood, lymphatic fluids, serum);* • *Describe parts and organs of the body by systems.*	
Learning outcomes	• *Develop an understanding of physiology of normal walking!* • *Expanding physiological knowledge to understand how the body works.* • *Develop concept on interrelation of various organs and its function in both mobility and stability* • *Analyze physiological function of all tissues, organ and systems*	

	of human body ● *Develop clear understanding on cell, tissue, organ and systems of Human body* ● *Develop an understanding Gait & Posture Physiology of human body* ● *Apply conception to explain composition of blood, nerve tissue, skeletal tissue and bones* ● *Understand the physiology of cartilage, ligaments, muscles and joint tissues.* ● *Understand to determine what goes wrong in disease or pathological conditions, facilitating the discovery of new diagnostics, treatments and preventative measure*
Theory (90Hours)	General Physiology Cell: Organelles: their structure and functions, Transport Mechanisms across the cell membrane, Body fluids: Distribution, composition Blood : Introduction: Composition and functions of blood, Plasma: Composition, functions. Plasma proteins. RBC: count and its variations, Haemoglobin - Anemia. Blood indices, PCV, ESR. WBC: Classification. functions, count, its variation of each. Immunity**.** Platelets:, functions, count, its variations**.** Blood coagulation. (brief)**.** Lymph: Composition, and functions. Nerve Muscle Physiology Introduction: Resting membrane potential. Action potential**.** Nerve: Structure and functions of neurons. Properties and impulse transmission of nerve fibres. Neuroglia: Types and functions. Muscle: Classification. Skeletal muscle : Structure. Neuromuscular junction, Motor Unit. Fatigue . Cardiovascular System Introduction: Physiological anatomy and nerve supply of the heart and blood vessels. Conducting system: Components. Impulse conduction Cardiac Cycle: Definition. Phases of cardiac cycle. Pressure and volume curves.. ECG: Definition. Cardiac Output: Definition. Functional anatomy of vascular and lymphatic system**.** Arterial Blood Pressure: Definition. Normal values and its variations**.** Hypertension Respiratory System Introduction: Physiological anatomy – Pleura, tracheo-bronchial tree, alveolus, respiratory membrane and their nerve supply. Functions of respiratory system. Respiratory muscles. Mechanics of breathing: – Inspiration; Expiration; Intrapleural pressure, Recoil tendency and lung volumes**.** Hypoxia**.** Disorders of Respiration Nervous System

	Introduction: Organization of CNS – central and peripheral nervous system. Functions of nervous system. Synapse: Functional anatomy, classification, Synaptic transmission. Sensory Mechanism: Sensory receptors: function, classification and properties. Sensory pathway: The ascending tracts – Posterior column tracts, lateral spinothalamic tract and the anterior spinothalamic tract – their origin, course, termination and functions. Pain sensation: mechanism of pain. Cutaneous pain – slow and fast pain, hyperalgesia. Deep pain. Visceral pain – referred pain. Sensory cortex. Somatic sensations: crude touch, fine touch, tactile localization, tactile discrimination, stereognosis, vibration sense, kinesthetic sensations**.** Motor Mechanism: Motor Cortex. Motor pathway: The descending tracts – pyramidal tracts, extrapyramidal tracts – origin, course, termination and functions. Reflex Action: Monosynaptic and polysynaptic reflexes, superficial reflexes, deep reflexes. Muscle tone –definition, and properties hypotonia, atonia and hypertonia. UMNL and LMNL. Spinal cord Lesions: Complete transection and Hemisection of the spinal cord. Cerebellum: Functions**.** Posture and Equilibrium: Thalamus and Hypothalamus: Nuclei. Functions. Basal Ganglia: Structures, functions. Cerebral Cortex: Lobes. Brodmann's areas and their functions. Higher functions of cerebral cortex – learning, memory and speech. Kidney and micturition Introduction and functional anatomy of kidney, innervation, renal circulation and care of any appliances fitting fir dysfunction. Micturition – Physiological anatomy and nervous connection of the bladder, cysto metrogram micturiton reflex. Integumentary system: Structure of skin, function of skin: Protection, heat regulation, sensation and elasticity Endocrinology Endocrine Pancreas: Secretory cells, action, regulation of secretion of insulin and glucagon. Glucose metabolism and its regulation. Disorder: Diabetes mellitus. Nutrition & Metabolism An Introduction to Nutrition and Metabolism**.** Factors influencing energy expenditure
Practical 30 Hours	Measurements and identification of blood cells and count (RBC, WBC, ESR, TC, DC, Color index, blood group) in normal and at least in one pathological condition Spirometry test, respiratory test and Vital capacity is the total of the tidal volume, inspiratory reserve volume, and expiratory reserve volume. In a normal healthy adult lung Heart rate, pulse rate, pulse oxy meter, blood pressure measurement

	Normal Cardiac response, E.C. G, PQRS graph Normal skeletal Muscle electro diagnostic measurements, EMG Metabolic Analyzer, Oxygen calorimetric and Physiological Cost Sensory and Motor examinations and tests

TEXT BOOKS & JOURNALS

Sl. No.	Title	Author	Publisher	Year/Vol.
1	Human Physiology	Chatterjee, C. C.	Medical Allied	1997 2V
2	Human Physiology for B.D.S and PT/OT Students	Dr. A. K. Jain		1 st Edition 1998
3	Text Book Of Medical Physiology	Guyton, A.C. and Hall, J. E.	W.B.Saunders, Singapore	1998
4	Essentials of Medical Physiology	*ABS* Mahapatra	A.B.S	
5.	Human Physiology	Gillian Pocock, Christopher D. Richards, David A. Richards	Oxford University Press	2018

Year : 1		
Subject	Materials Science and P&O Lab Technology	
Code	**BPO 103**	
Teaching Hours : 120	**Theory : 90**	**Practical : 30**
Total Credits : 04	**Theory : 03**	**Practical : 01**
Course Description	The structure of the course has been designed to impart knowledge and skill in P&O fabrication units and labs. Different Material used, their specification, both physical and chemical properties, machines/tools safety and hazards.	
Learning objectives	• *Be familiar with the occupational health and safety policy and procedures in the work place.* • *Demonstrate proficiency in the use of hand tools and machine tools commonly used in the fabrication of Prostheses & Orthoses.* • *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.*
Learning outcomes	● *Understand the fundamental concepts of materials science in the aspects of composition, specification and structure of metal, plastics, alloys, leather, fabrics, foams and strength of materials and able to solve the issues in practical engineering applications* ● *Learn to work and function effectively on a team within the ethics, norms and standards of safety , hazards and provide leadership, create a collaborative and inclusive environment inside the Lab* ● *Learn to operate all machines and tools in the Lab* ● *Understand do's and don'ts of Machines and tools* ● *Develop ability to recognize ethical and professional responsibilities in difficult/different situations of fabrication and make informed judgments* ● *Learn to interpret material testing and conduct appropriate experimentation, analyze and interpret data, and use specific judgment to draw conclusions*
Theory (90Hours)	General Introduction to bench work, Hand tools, Machineries, Introduction to common machineries for fabrication of P & O and AT devices Prosthetic and Orthotics Laboratory Safety & Hazards and Care Fundamental of riveting, soldering, brazing and welding CNC , CAD/CAM, 3-D printer, Drill , Millings, Router , Socket Shaper 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. Leather, types, tanning, preservation, lamination, properties and adhesives for leather. Fabric types, properties, utilization, selection and quality control 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. Different types of foams used in P&O especially Latex, Polyurethane, polyethylene and other kind of rigid/ semirigid/ flexible foams. Plaster of Paris& Silicon and its application procedure in Prosthetic & Orthotic technique 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: Acrylic and Polyester. Elastomers, H.D.P.E. PP, PP- CP, Viscoelastic behaviour of plastics. Introduction to fibre 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
Practical 30 Hours	Material properties testing procedure- Impact testing, strength testing, thermal properties, mechanical properties testing, Hardness Testing, Sore Testing, Universal Testing Machine and Material Simulation Welding, Bending, Orthotic Joint Fixing , Wheel Seat fixing, shouldering, Brazing Designing and shaping, Pattern cutting, Layout and padding CNC controlled drill programing, 3-D printer programing and fabrication, CAD/CAM

TEXT BOOKS & JOURNALS-

Sl. No.	Title.	Author	Publisher	Year/Vol
1.	Physics of Plastics Processing, Properties and Materials Engineering	Arthur W. Birley, Barry Haworth, Jim Batchelor	Hanser Publishers	1992
2.	Composites, Science, and Technology	R. C. Prasad, P. Ramakrishnan	New Age International	2000
3.	Handbook of Polymers	George Wypych	Elsevier Science	2022
4.	Comprehensive Workshop Technology (Manufacturing Processes)	S. K. Garg	Laxmi Publications	2009
5.	Workshop Technology Part 1& Part 2	W. Chapman	CRC Press	2019
6.	Material science &engineering, Volumes 1 and 2 (two Volume Set)	A. K. Haghi, Abbas Hamrang, E. Klodzinska, Gennady E. Zaikov	Apple Academic Press	2018
7.	Handbook Medical Laboratory Technology	V. H. Talib	CBS Publishers & Distributors	2019
8.	Carbon Fibres and Their Composites	Erich Fitzer	Springer Berlin Heidelberg	2012
9.	Materials Science		S. Chand Limited	2008
10.	Leather Processing & Tanning Technology Handbook	NIIR Board of Consultants Engineers	NIIR PROJECT CONSULTANCY SERVICES	2011
11.	Plastics Technology Handbook	Manas Chanda	CRC Press	2017

12.	Polymer Foams Handbook	Nigel Mills		

Journals :

- Journal of Applied Polymer Science
- Journal of Material Sciences & Engineering
- The International Journal of Advanced Manufacturing
- Journal of Prosthetics & Orthotics

Year : 1		
Subject	Biomechanics and Kinesiology	
Code	**BPO 104**	
Teaching Hours : 90	**Theory : 90**	**Practical : 0**
Total Credits : 03	**Theory : 03**	**Practical : 0**
Course Description	The understanding of Bio-mechanical principles of Prosthetics and Orthotics will be the foundation of the work of the students. It is 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 aanalysis of those situations.	
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 temporalspatial, kinematic and kinetic information to distinguish between normal and abnormal function of the upper limbs , lower limbs &Spine.* • *Analyzetheforcesataskeletaljointforvariousstaticanddynamicactivities* • *Demonstrate the ability to analyze forces and moments applied to the body by prosthetic and orthotic devices.* • *Applybiomechanicalprinciplestogenerateoptimalsolutionstoclinicalproblems in prosthetics and orthotics.* • *Understand the concepts of differentiation and integration and evaluate* • *derivatives and integrals of a function* • *Introduce students to the mechanical principles that can be applied to human structure and function of human movement and the musculoskeletal system.* • *To develop the basic understanding of biomechanics and kinesiology and its application in human body movements in performing activities.* • *To estimate posture and human gait parameters in normal and*	

	pathological conditions. ● *To explain the concept of mechanical laws govern human motion.* ● *Use of digital technology in measuring human gait parameters.*
Learning outcomes	● *Identify, analyze, and solve various biomechanical problems.* ● *Identify the major factors involved in the angular kinematics of human movement.* ● *Understand the Linear and angular kinetics of normal human locomotion.* ● *Ability to apply the mechanical concepts to understand human movement.* ● *Able to to do the gait analysis of pathological gait and quantify biomechanical deficit.* ● *Ability to understand the mechanics of bone .joints, ligaments and soft tissue.* ● *To know the use of digital equipment in assessment of pathological gait.*
Theory (90Hours)	Fundamentals of Biomechanics- Kinetics, Kinematics Statics and dynamics Types of Motion, Location of Motion, Direction of Motion, Magnitude of Motion, Definition of Forces, Force of Gravity Reaction forces, Equilibrium, Objects in Motion, Laws of Motion, Force of friction, Concurrent force systems, Parallel force systems, Work, Moment arm of force, Force components Equilibrium of levers. Kinesiology : Definition, Origin & development, Forms of human movement and their characteristics, Physical fitness Physical activity and sports, Motor learning and Movement intelligence, Nutrition, Health promotion and disease prevention. Joint structure and Function: Joint design, Materials used in human joints, General properties of connective tissues, Human joint design, Joint function, Joint motion Biomechanics of Shoulder Complex: Components of shoulder complex, Integrated Function of Shoulder Complex, Mobility and Stability of Shoulder Complex, Structural and Functional Dysfunctions around Shoulder Complex Biomechanics of Elbow Complex: Structure and function of the Elbow Complex, Structure and Function of the superior and inferior Radio-ulnar Joints, Mobility and Stability of Elbow Complex, Effect of Immobilization and Injury Biomechanics of the Wrist and Hand Complex : Structural components of the Wrist complex, function, structure and function of the Hand Complex, Finger Musculature, Functional Position of the Wrist and Hand

	Biomechanics of the Hip Complex: Structure and Function of the Hip Joint, Arthrokinematics and Osteokinematics, Hip Joint Musculature, Stability, Muscle Function in Bilateral and Single leg Stance, Trabecular System, Biomechanical alteration in various Hip joint Pathology Biomechanics of the Knee Complex: Structure and Function of the Tibiofemoral Joint, Static and Dynamic stability of Tibiofemoral Joint, Structure and Function of the Patellofemoral Joint, Stability of Patella, Biomechanics changes in the Knee complex with Pathology Biomechanics of the Ankle Complex: Kinematics and Kinetics of the Tibiotalar Joint, Stability of the Ankle Joint, Arch of foot, Effect of weight bearing on foot Biomechanics of Spine: Motions of the spine, Biomechanics of different region of spinal column, Biomechanics of Inter vertebral disk, Design concept part-I: Buckling, theories in failure/ fatigue/stress concentrations, connections, fluid mechanics, and beam deflection. Design concept part-II: Shear force and bending moment diagrams, centroids, 2nd moment of area and mass, theorem of parallel axes, bending stress, torsional stress of circular shafts, combined axial and bending stresses. Combined and torsional stresses, combined axial bending torsional stresses. Open and closed helical springs, beam deflection.
Practical 0 Hours	

TEXT BOOKS

Sl. no.	Title	Author	Publisher	Year/ volume
1	Human walking	Rose, Jessicaed.		
2	Kinesiology: Application to Pathological Motion	Soderberg, L.ed.	Lippincott Williams and Wilkins	1986
3	Introduction of Kinesiology, 2nd ed.	Hoffoman J. ed.	Human Kinetics Publishers	2009
4	Biomechanical Basis of Human Movement	Hamill, Joseph		
5	An Introduction to Biomechanics	D. Humphey		
6	Muscles, nerves & movement, 3rd ed.	Tyldesley, Barbara	Wiley Blackwell	1996
7	Gait analysis	Perry, Jacuelin		
8	Human body dynamics	Tozeren, Aydin		
9	Human motion analysis	Harries, G.F.ed		
10	Clinical biomechanics	Dvir, Zeevi		

11	Basic Biomechanics	Hall, Susan J	McGraw-Hill	
12	Gait disorders	Hausdorff, Alexander, Jeffrey M, Neil	McGraw-Hill	
13	Fundamentals of Biomechanics ,2nd ed.	Duane Knudson	B. I. Publications	
14	Principles of mechanics and biomechanics	Stanley Bell,P Frank		
15	Clinical Biomechanics	Black Jonathan	B. I. Publications	
16	Biomechanics of the Foot and Ankle	Donatelli, R.A. Davis, Philadelphia	Davis, Philadelphia	
17	Biomechanics of Musculoskelton System	Benno M. Nigg		Springer Nature
18	A D Manual of Fracture	Wagner Mechael		Wiley Blackwell
19	Clinical Biomechanics of Lower Limb	Ronal C Valmassy	9.7808E+12	Elsevier Health U.S
20	Biomechanics: Mechanical Properties	Y. C. Fung		Elsevier Health U.S
21	The Physics of Living Tissue	Fabrizio Cleri		Springer Nature
22	Text book of Fluid Mechanics	C. Rajput		Springer Nature
23	Biomechanics of Spine	White & Punjabi	Concept of Physics	.

Year : 1		
Subject	Prosthetics Science 1	
Code	**BPO 105**	
Teaching Hours : 90	**Theory : 90**	
Total Credits : 03	**Theory : 03**	**Practical : Practical paper given separate in Subject Code 152**
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.	
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. • Discussbiomechanicalforcesystemsandusetheseprinciplesin generating an appropriate prosthetic prescription. • Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices. • Compareandcontrastthefunctionalcharacteristicsofprostheti ccomponents. • Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations. • Understand and describe the roles of key members of the health care team and identify how they interrelate with the Prosthetist and Orthotists
Learning outcomes	• To assess and collect information of amputee lost part of the body including socioeconomic status and remaining functions affecting locomotion • Understand composition and specification of raw materials and components used in lower extremity prosthesis • To develop an understanding of the compensatory mechanism of the human body and its ability to adapt itself to overcome functional deficiencies of its parts. • To provide a frame of reference for evaluating the degree of success obtained in replacing lost functions by means of an artificial leg. • To obtain information on the cause and possible treatment of phantom pain and other medical problems of the amputee • To design and prescribe best combination of components for improve fitting for better comfort and function. • Understand measurement taking, casting of partial foot, symes, transtibial and transfemoral positive mould • Understand biomechanical modification of partial foot, symes, transtibial and transfemoral positive mould • Learn the procedure of fabrication of socket and procedures used in fitting and alignment of prosthesis • Understand and apply fundamental principles to the problem of fit and alignment and to formulate the guiding principles involved. • To develop mechanical aids to improve fit and alignment

	and to serve as tools to simplify lab operations. • To investigate and evaluate types of suspension as well as materials and methods used in socket fabrication. • To develop simplified methods of evaluating the amputee-limb combination-to be used as a check by the prosthetist, the physician and other team members. • To improve methods of training the lower-extremity amputee in order to get better functional and more effective use of his prosthesis.
Theory (90Hours)	**Introduction** – Introduction to Prosthetics, definitions of various terminologies, Historical development in Lower Extremity Prosthetics in India and abroad. **Prosthetic Feet**: Classes of Various types of Prosthetic Feet **Partial Foot Prostheses**: Various types of Partial foot prosthesis. Biomechanics of Partial foot prosthesis, Prescription Principles, Materials used for partial foot prostheses, various casting & fabrication techniques of Partial foot prosthesis. Various types of Symes Prosthesis, Prosthetic components, Prescription criteria, Principles. Materials used for Symes prosthesis, casting techniques. Cast modification. Fabrication & alignment techniques for Symes prosthesis **Trans Tibial**: Various types of trans-tibial prostheses technology, Prosthetics Components – both conventional and modular. Trans-tibial, Prosthetic Prescription Criteria and principles. Materials used in Trans-tibial Prosthesis. Measurement and casting techniques for Trans-tibial prosthesis. Cast modification. Fabrication techniques for trans-tibial prosthesis. Fabrication Technique for trans-tibial Conventional Prosthesis – both Open and close ended socket, Different types of socket designs – PTB, PTS, PTBSC, PTB-SCSP TSB etc, Different types of suspension. Alignment techniques **KneeJoints:** Different types of Endoskeletal and exoskeletal knee joints-Single axis knee joints, Polycentric knee joints, Free knee, Constant friction knee joints, Variable friction Knee joint, microchip control knee, hydraulic knee joint, swing Phase control knee joints, Stance Phase control knee joints etc **Hip Joints:** For above knee as well as for hip disarticulation/ hemi- pelvictomy – all types of hip joints especially single axis and Swivel type **Through Knee Prosthesis:** Various types of through knee prosthesis-Through knee prosthetic Components. Materials used for through knee prosthesis. Casting, modification and fabrication techniques for through knee prosthesis **Trans Femoral Prosthesis:** Types of Trans Femoral Prosthesis. Trans femoral Prosthetic Components. Trans

	Femoral Socket designs. Casting and measurement techniques, Cast modification, Fabrication techniques of Trans Femoral socket. Various types of suspension used in Trans Femoral Prosthesis **Introduction to ALIMCO and other Indian manufacturer components:** Different types of Foot, Knee, Hip Joint manufactured by ALIMCO, Parivartan Kit for Both Below Knee & above knee Prosthesis, Kadam Knee, Ranger foot, Jaipur foot and others
Practical	**Practical paper given separate in Subject Code 152**

Text Books and Journals

Sl. No.	Title	Author	Publisher	Year/Vol./ Edition
1	Amputations & Prosthetics	May Bella J.	Jaypee Publisher New Delhi	1996
2	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	American Academy of Orthopaedic Surgeons	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
3	Orthotics and Prosthetics in Rehabilitation	Michelle M. Lusardi PhD PT and Caroline C. Nielsen PhD		3rd ed.
4	Prosthetics & Orthotics	Shurr. G. Donald & J.W. Michel		2nd ed
5	Prosthetics & Orthotics Lower Limb & Spine	Seymour, Ron		2002
6	Introduction to microprocessor	Mathur U.N. Dhur A.P	Mac-Graw Hill Inc. New Delhi	
7	Prosthetic & patient management	Kevin Croll		1 june , 2006
8	Hydraulics and pneumatics	Parr, Andrew		1993
9	Foot and ankle in sports	Bates, Andrea		1996
10	Maintenance and care of the prosthesis	C.A.Hannesseg		
11	Manual for lower Extremity prosthetics	Miles Anderson	Mosby publications/ or N.Y.U. St. Louice, London, Chickago	
12	Hip disarticulation Prosthesis	C.A.Melancik		
13	New Advances in Prosthetics and Orthotics	Mark H Bussell		1st March 2006

14	The Immediate postoperative Prosthesis in L.E E. Amputation	Andrew C. Ruoff & Others		
15	Congenital Limb Deficiency	Charles A Frank		
16	Above Knee Amputation Prosthetic Principles & Practice	Zems Grim		
17	Hemipelvectomy Prosthesis	Fred Hampton		

Year : 1		
Subject	Orthotics Science 1	
Code	**BPO 106**	
Teaching Hours : 90	**Theory : 90**	**Practical : Practical paper given separate in Subject Code 153**
Total Credits : 03	**Theory : 03**	
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.	
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 patient 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 normalandpathologicalgaitandusethisinformationtojustifythese lection and design of appropriate devices.* ● *Discussbiomechanicalforcesystemsandusetheseprinciplesingen erating an appropriate orthotic prescription.* ● *Assessthemedicalconditionofapatientrelatedtotheirorthoticman agementusin g 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.* ● *Createthefinaldesignoftheorthosisthroughmodificationoftheposi tivecastand/ 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 tramlines.* ● *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 patient/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 patient / client at the centre.* ● *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 wider angle clinical situations.* ● *Understand and describe the roles of key members of the healthcare team and identify how they interrelate with the Prosthetist & Orthotist.*
Learning outcomes	● *To assess and collect information of patient/client problems associated with the body parts including socioeconomic status and remaining functions affecting locomotion* ● *Understand composition and specification of raw materials and components used in lower extremity Orthosis*

	• *To design and prescribe best combination of components for improve fitting for better comfort and function.* • *Understand shoe modifications and parts of shoe in controlling foot function* • *Understand measurement taking, layout, casting of foot, leg, knee and hip joint* • *Understand and apply fundamental principles to the problem of fit and alignment of orthosis and to formulate the guiding principles involved.* • *To develop mechanical aids to improve fit and alignment and to serve as tools to simplify lab operations.* • *Understand evidence based clinical prescriptions for the orthotic management of clients with complex lower limb presentations* • *Learn to Identify and explain how client characteristics (eg. physical characteristics, social, environmental and financial factors, activity level) influence orthotic prescription* • *Ability to present a logical, evidence based argument to justify the prescription* • *Develop skill to communicate a strong rationale and evidence base for the development of an orthotic prescription* • *Demonstrate competence in clinically relevant professional skills related to the provision of lower limb orthoses* • *Learn to undertake patient interactions including assessment, fit and optimisation of orthotic devices* • *Develop skill on the fabrication of lower limb orthotic devices using appropriate materials and technical procedures to achieve clinical goals, including the implementation of safe work practices.*
Theory (90Hours)	Introduction to Orthotics, definitions of various terminologies, History of Orthoses in India and abroad. Various materials used in Orthotics. Foot & Ankle Deformities **Different types of foot Orthoses** **Pedorthics**: Medial/Lateral raise (Inside /outside shoe), M.T. Bar (Inside / Outside shoe),Arch support, Meta tarsalpad, Calcaneal heel wedge, Heel raise, Thomas Heel, Heel pad for Calcaneal spur, 'T' strap (Medial and lateral), Fixation of stirrup plate in shoes/ Sandal, Various types of Arch Supports – flexible/semi rigid/rigid/custom moulded, SMO-Custom moulded Supra malleolar orthosis. **AFO (Ankle Foot Orthosis):** Conventional AFO-, Custom made AFO (Articulated& Non articulated A.F.O & various types of ankle joints, Prescription principles of various types of Knee Orthoses (KO), Knee Ankle Foot Orthoses (KAFO),Hip Knee Ankle foot

	Orthoses (HKAFO). RGO & ARGO Orthoses **Fabrication Techniques ;** Cast and measurement techniques, appropriate selection of materials and components, cast modification, fabrication and alignment technique, using of different technologies – its advantages and disadvantages, Accommodation of limb length discrepancy while designing orthosis, Gait analysis and checkout procedures **Hip Orthotics:**Orthoses for sports injury, Reciprocating Gait Orthoses (RGO), Hip Guidance Orthoses(HGO), Fracture Cast Bracing, Swivel walker, orthopodium/ Parapodium.Weightrelievingorthoses,ExtensionorthosesorOrtho-prostheses, PTB. Orthoses Orthotic management of Rickets and Knee Arthritis **ALIMCO and other Indian manufacturer Orthotic Components:** Different Types of Ankle Joint,Knee, and Hip Joint. Ankle Foot Orthosis kit, Knee Ankle Foot Orthosis Kit, Hip Knee ankle Foot Orthosis Kit, materials components etc
Practical	**Practical paper given separate in Subject Code 153**

TEXT BOOKS & JOURNALS

Sl. No.	Title	Author	Publisher	Year/Vol./ Edition
1.	AAOS atlas of Orthosis and assistive devices, Powered LowerLimb Orthotics in Paraplegia	Hsu, John D.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
2.	Bio-mechanical basis of Orthotics Management	J. Hughes		
3.	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	P.Bowker, D.N. Conde D.L.Bader, D.J.PRATT	Butter worth Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP	
4.	Orthology: Pathomechanics of LowerLimb Orthotic Design	Jan Bruckner and Joan Edelstein		
5.	AmericanAcademy of Prosthetists&Orthoti sts	Orthotics Etcetera		
6.	New Advances in Prosthetics and Orthotics	John B Redford		3rd ed.
7.	Functional fracture bracing	Mark H Bussell		1st March 2006
8.	Manual of Lower Extremity Orthotics	Sarmiento, A.		Jan 1995
9.	FOOT ORTHOSIS	AAOS	Springfield	1st jan 1975

10.	An Atlas of Lower Limb Orthotic Practice	Kent, Wu		1st ed.
11.	Orthotics in functional rehabilitation of the lower limb	D.N. Condieand S. Turner		10 th aprl,1997
12.	Orthotics	Nowoczenski, Deborah A.		1st jan, 2004
13.	Orthotics In Functional Rehabilitation of the Lower Limb	Edestein, Joan E. Deborah A. Nawocze	Jaypee Publisher New Delhi	10th aprl. 1997

Year : 1		
Subject	Anatomy	
Code	**BPO 151**	
Teaching Hours : 90	**Theory : Theory paper given separate in Subject Code 101**	**Practical : 90**
Total Credits : 03		**Practical : 03**
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.	
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.*	
Learning outcomes	● *Develop an understanding of basic terminology* ● *Develop concept on interrelation of various organs and its function in human locomotion* ● *Analyze structure and function of all systems of human body* ● *Develop clear understanding on cell, tissue, organ and systems of*	

	Human body ● *Develop an understanding musculoskeletal system of human body* ● *Apply conception to explain composition, structure and categories of the bones according to their shape* ● *Understand the Principle and function of skeletal system* ● *To gain a more complete understanding of different types of joints and describe the structure of synovial joints*
Theory	**Theory paper given separate in Subject Code 101**
Practical (90 Hours)	To identify and mark the surface of the body, joint axis, important landmarks of human body, demonstration on model or any volunteer in the class Demonstration of origin, insertion of all muscles in extremities on dissected human body or in 3-D model or in cadaver Demonstration of gross system, joints and viscera of the body Demonstration of heart, kidney, lungs, Lower limbs, upper limbs, spine and brain Demonstration of complete nervous system in dissected body or in 3D model CNS and PNS Demonstration of all long and short Bones of the extremities Demonstration of osseous structure of Arches of foot, hand, skin of the palm and dorsum of hand. Demonstration of Mandible and bones of the skull

Year : 1		
Subject	Prosthetics Science 1	
Code	**BPO 152**	
Teaching Hours : 240	**Theory : Theory paper given separate in Subject Code 105**	**Practical : 240**
Total Credits : 08		**Practical : 08**
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.	
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 component 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.*
Learning outcomes	• *Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and tramlines.* • *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 patient / 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.*
Theory	**Theory paper given separate in Subject Code 105**
Practical (90 Hours)	Taking case history of a minimum of 10 individuals Patients (Different types of lower extremity amputation cases) Assessment, casting & fabrication of Partial foot prosthesis on model / mannequins Fabrication of Prosthetic Feet, Partial foot modifications and filler Assessment, casting & fabrication of Chopart Prosthesis on model / mannequins Assessment, casting & fabrication of Symes' Prosthesis on model / mannequins Assessment, casting & fabrication of Trans-tibial prosthesis on model / mannequins Assessment, casting & fabrication of through knee prosthesis on model / mannequins Assessment, casting & fabrication of Transfemoral prosthesis on model / mannequins Assessment, measurement, casting, cast modification, molding, lamination of socket, socket trimming, socket trial of partial foot, symes, transtibial, above Knee prosthesis and through knee prosthesis. Silicone Cosmetic prosthesis on patient

TEXT BOOKS & JOURNALS

S. No.	Title	Author	Publisher	Year/Vol./ Edition
1	Amputations & Prosthetics	May Bella J.	Jaypee Publisher New Delhi	1996
2	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	American Academy of Orthopaedic Surgeons	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
3	Orthotics and Prosthetics in Rehabilitation	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD		3rd ed.
4	Prosthetics & Orthotics	Shurr. G. Donald&J.W.Michel		2nd ed
5	Prosthetics & Orthotics Lower Limb& Spine	Seymour, Ron		,2002
6	Introduction to microprocessor	MathurU.N.Dhur A.P	Mac-Graw Hill Inc. New Delhi	
7	Prosthetic &patient management	KevinCroll		1 june ,2006
8	Hydraulics and pneumatics	Parr, Andrew		1993
9	Foot and ankle in sports	Bates, Andrea		1996
10	Maintenance and care of the prosthesis	C.A.Hannesseg		
11	Manual for lower Extremity prosthetics Publisher : Mosby	Miles Anderson	Mosby publications/ or N.Y.U. St. Louice, London, Chickago	
12	Hip disarticulation Prosthesis	C.A.Melancik		
13	New Advances in Prosthetics and Orthotics	Mark H Bussell		1st March 2006
14	The Immediate post operative Prosthesis in L.E E. Amputation	Andrew C. Ruoff& Others		
15	Congenital Limb Deficiency	Charles A Frank		
16	Above Knee Amputation Prosthetic Principles & Practice	ZemsGrim		
17	Hemipelvictomy Prosthesis	Fred Hampton		

Year : 1		
Subject	Orthotics Science 1	
Code	**BPO 153**	
Teaching Hours : 240	**Theory : Theory paper given separate in Subject Code 106**	**Practical : 240**
Total Credits : 08		**Practical : 08**

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.
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.
Learning outcomes	● 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 tramlines. ● 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 patient / 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 patient / client at the centre.
Theory	**Theory paper given separate in Subject Code 106**
Practical (90 Hours)	Taking case history of a minimum of 10 individuals / Patients Assessment, Evaluation & fabrication of Different types of foot

	Orthoses on model / mannequins Assessment & Evaluation of Shoe modifications Assessment, casting & fabrication of all types of Mechanical Ankle Joint, conventional& custom moulded (A.F.O.) on model / mannequins Assessment, casting & fabrication of functional fracture Orthosis for below knee on model / mannequins Assessment, casting & fabrication of KAFO/ KO on model / mannequins Assessment, casting & fabrication of HKAFO on model / mannequins Orthoses in Lower Motor Neuron Disorders, Orthoses in Upper Motor Neuron Disorders, various types of knee Orthoses, Weight relieving orthosis, Floor reaction orthosis, Toronto Brace, Low cost Orthoses, Bilateral H.K.A.F.O, Orthoses in Arthritis, Orthoses in Fractures, Orthoses in Hemophilia, Orthoses in Progressive Muscular Dystrophy, Orthoses in Juvenile Disorders etc.

TEXT BOOKS & JOURNALS

S. No.	Title	Author	Publisher	Year/Vol./ Edition
1.	AAOS atlas of Orthosis and assistive devices,	Hsu, John D.		5th ed.
2.	Powered Lower Limb Orthotics in Paraplegia	J. Hughes	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	
3.	Bio-mechanical basis of Orthotics Management	P.Bowker, D.N. Conde D.L.Bader, D.J.PRATT		
4.	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	Jan Bruckner and Joan Edelstein	Butter worth Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP	
5.	Orthology: Pathomechanics of Lower Limb Orthotic Design	American Academy of Prosthetists & Orthoti sts		
6.	Orthotics Etcetera	John B Redford		3rd ed.
7.	New Advances in Prosthetics and Orthotics	Mark H Bussell		1st March 2006
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9.	Manual of Lower Extremity Orthotics	AAOS		
10.	FOOT ORTHOSIS	Kent, Wu	Springfield	1st jan 1975

11.	An Atlas of Lower Limb Orthotic Practice	D.N. Condieand S. Turner		1st ed.
12.	Orthotics in functional rehabilitation of the Lower limb	Nowoczenski, Deborah A.		10 th aprl,1997
13.	Orthotics	Edestein, Joan E.		1st jan, 2004
14.	Orthotics In Functional Rehabilitation of the Lower Limb	Deborah A. Nawocze	Jaypee Publisher New Delhi	10th aprl. 1997

SECOND YEAR

Year : 2	
Subject	**Clinical Pathology**
Code	**BPO 201**
Teaching Hours : 60	**Theory : 60**
Total Credits : 02	**Theory : 02**
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 Prosthetist & Orthotist. In addition, s/he should be able to advise on care and appropriate treatment options.
Learning objectives	• *Describe the basic pathological processes that underlie disease (eg: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).* • *To study and diagnosis human disease*
Learning outcomes	• *Understand the language of disease with essential medical knowledge* • *Understand the blood report, body fluid and and its examination to report the abnormalities.* • *Get clear insight the underline cause of human disease and its impact on functional mobility* • *Acquire knowledge and understand the formation of blood cells, structure, functions and methods of estimating different parameters in disease conditions* • *Apply safety precautions, quality assurance, biomedical waste management* • *Learn the normal values of RBC, WBC and platelet and its differential count in disease.*

Theory (60 Hours)	General: Introduction to pathology, basic mechanism of health and disease, Clarification of disease. Inflammation –Acute inflammation: features, causes, vascular and cellular events. Chronic inflammation: Causes, Types, Classification. Cell Disease, Necrosis, Gangrene and hypoxia, Repair, Wound healing by primary and secondary union, factors promoting and delaying the process. Hemodynamic disorders, thrombo embolic disease & shock. Ischemic, necrosis, thrombosis, embolism, Infarction, shock. Gangrene. Thrombo angitis obliterans. Neoplasia – Definition, classification, Biological behavior : Benign and Malignant, Carcinoma and Sarcoma, principles of their spread. Hypersensitivity diseases and immunity – Brief overview of hypersensitivity reaction allergies & auto immune diseases. Genetic disorders–Brief overview of genetic disease. Neurovascular diseases: Outline of Cerebral-vascular disorders, Trauma to brain and spinal cord, Demyelinating diseases like multiple sclerosis., Degenerative diseases like parkinsons, disease. Peripheral vascular disease, Poliomyelitis. Metabolicdisorders– Diabeticmellitus-Types,Pathogenesis,Pathology, Laboratory diagnosis Disorders of blood. Constituents of blood and bone marrow, Regulation of hematopoiesis. Anemia: Classification, clinical features & lab diagnosis. Bone disorder/disease- Bone cancer, Osteomyelitis, Osteopaenia, Osteoporosis, Paget's disease of bone, Rickets and others Neuro-Muscle disease: Myopathy, Muscular Dystrophy, Multiple Sclerosis, Myasthenia Gravis, Amyotrophic lateral sclerosis (ALS), Charcot-Marie-Tooth disease, Myositis, including polymyositis and dermatomyositis and Peripheral neuropathy. Nervous System: Alzheimer's disease, Bell's palsy, Cerebral palsy, Epilepsy. Motor neurone disease (MND), Neurofibromatosis and Parkinson's disease.

TEXT BOOKS & JOURNALS

SL NO.	TITLE	AUTHOR	PUBLISHER	YEAR / VOL
1.	Essential of Clinical Pathology	Shirsh M. Kawthalkar		3rd Ed.
2.	Pathology For Allied Health Sciences	Ramdas Nayak		1st June ,2017

3.	Pathologic Basis Of Disease	Kumar, Abbas, Aster		9th ed.
4.	Concise Text in Clinical Pathology	Dr. Sharwan Choudhary, Dr. Dharmaveer Sihag		
5.	A Short Text Book Pathology	Md Tahminur Rahman Sjal, Hosne Ara TahminCharu	Jaypee	2nd ed.
6.	Basics of Pathology	Robins		
7.	TESTBOOK OF PATHOLOGY	Dr. Harsh Mohan	JAYPEE	8TH

Year : 2	
Subject	**Pharmacology & Emergency Medicine**
Code	**BPO 202**
Teaching Hours : 60	**Theory : 60**
Total Credits : 02	**Theory : 02**
Course Description	The students will be able to acquire understanding of pharmaco-dynamics, pharmacokinetics, and principles of therapeutics and Prosthetic and Orthotic implications. Introductory course provides the foundational knowledge needed for an Emergency Medicine rotation for clinically-prepared medical students, residents, or practicing physicians. The first component involves completing the Units which provide: initial assessment
Learning objectives	● *Understand the pharmacology of common chemotherapeutics.* ● *Understand common antiseptics, disinfectants and insecticides.* ● *Understand drug acting on various systems of human body.* ● *Appreciate alternative systems of medicines.* ● *To acquire basic knowledge and skills of the emergency aspects of medical and surgical intervention and its application within the golden hour.* ● *To learn the Components in life saving emergency interventions and skills.* ● *Be familiar with the fundamentals methodology.* ● *Possess humanistic qualities, attitudes and behaviour necessary for the development of appropriate patient-doctor relationship.* ● *To assist and if necessary train the communities* ● *To keep up-to-date and be familiar with all recent advances in the field of Emergency medicine.*
Learning outcomes	● *Understand the basic concepts of pharmacology* ● *A basic diagnostic and treatment approach to common emergency department presentations,* ● *Skills on patient management and communication,* ● *An overview of common emergency diseases* ● *Understand medical history taking and physical examination.* ● *Recognize immediate life-threatening conditions .* ● *Know patient management skills.*

	• *Understand health promotion for the patient. Obtain an accurate, focused history based on the patient's chief complaint.* • *Perform a focused physical examination based on the patient's chief complaint.*
Theory (60 Hours)	**General Pharmacology:** Definitions: Pharmacology, Drug, Therapy, Sources of drugs with examples. Routes of drug administration: Oral (Enteral, Parenteral, Inhalation, (Advantages and disadvantages with the examples of drug administered). Pharmacokinetics of drugs -Absorption, Distribution, Biotransformation and Elimination of drugs with their clinical implications. Pharmacodynamics: Mechanism of action, factors modifying drug actions with examples, drug interactions, combined effects of drugs- synergism, Drug antagonism Therapeutics: Drug dosage, Principles of drug therapy, Adverse drug reactions and contraindication **Autonomic Nervous system:** Cholinergic and Anti-Cholinergic drugs, Adrenergic and Adrenergic blocking drugs, Peripheral muscle relaxants **Neuropharmacology:** Sedative-Hypnotic Drugs: Barbiturates, Benzodiazepines, Anti-anxiety Drugs: Benzodiazepines, Other Anxiolytics, Drugs Used in Treatment of Mood Disorders: Monoamine Oxidase Inhibitors, Tricyclic Antidepressants, Atypical Antidepressants, Lithium, Anti-psychotic drugs **Disorders of Movement:** Drugs used in Treatment of Parkinson's Disease, Antiepileptic Drugs, Spasticity and Skeletal Muscle Relaxants **Inflammatory / Immune Diseases:** Non-narcotic Analgesics and Nonsteroidal Anti-Inflammatory Drugs, Acetaminophen, NSAIDs, Aspirin, Nonaspirin NSAIDs, drug Interactions with NSAIDs, Gluco-corticoids: Pharmacological Uses of Glucocorticoids, adverse effects, Physiologic Use of Gluco-corticoids. Drugs Used in Treatment of Arthritic Diseases: Rheumatoid Arthritis, Osteoarthritis, Gout, Drugs Used in the Treatment of Neuromuscular Immune/ Inflammatory Diseases: Myasthenia gravis, Idiopathic Inflammatory Myopathies, systemic lupus Erythmatosus, Scleroderma, Demyelinating Disease **Respiratory Pharmacology:** Obstructive Airway Diseases, Drugs used in Treatment of Obstructive airway Diseases, Allergic Rhinitis **Digestion and Metabolism:** Gastrointestinal Pharmacology: Peptic Ulcer Disease, Constipation, Diarrhea, Drugs Used in

	Treatment of Diabetes Mellitus: Insulin, Oral Hypoglycemics. Thyroid and anti-thyroid drugs
	Geriatrics: Pharmacology and the geriatric Population: Adverse effects of special concern in the Elderly, Dementia, Postural hypotension, urinary in continence **Cardiovascular pharmacology:** Drugs used in the treatment of Heart failure; Anti-Hypertensive Drugs-Beta blockers, ACE Inhibitors, Calcium channel inhibitors, Alpha Blockers, Vasodilators, Drugs used in Myocardial ischemia (Heart attack)-Coronary vasodilators, Thrombolytics, anti-coagulants. **Chemotherapy of infections:** definitions, classification of anti-microbial agents- Beta lactam antibiotics-Penicillin, Cephalosporins, Aminoglycosides antibiotics, Broad spectrum antibiotics-Tetracyclines, sulphonamides, anti-fungal drugs, anti-protozoal-Metronidazole, anti-malarial, anti-viral drugs, Anti-Tuberculosis **Miscellaneous:** General management of drug Poison with antidotes Prevention and Drug therapy used in emergencies a. Seizures b. Anaphylactic shock c. Status asthmaticus d. Diabetic ketoacidosis e. Shock f. Cardiac arrest g. Snake bite poison **h.** Head injury
	EMERGENCY MEDICINE
	Basic and advance skills of Life support systems (BLS). First aid, CPR techniques, Measuring Blood pressure, Blood sugar level, Pulse rate etc. Knowledge of G- group medicines with respect to prosthetics, orthotics, Rehabilitation science, general and National emergency. BLS in adult victims, paediatric victims , pregnant victims Management of Seizures , Poisoning , Chest pain / Heart attack o Snake bite, Bee sting , Drowning Recovery position Emergency management of Scene safety , Primary assessment (ABCDE) , Bleeding control/hemorrhage control , Cervical spine stabilization & cervical collar application, Care of amputated body part , Helmet removal , Extrication of victim from vehicle and safe transfer , Splinting of broken limb and Good Samaritan law.

	To know the details of Hospital referral procedures. Emergency Orthopaedics and wound care management Basic eye care techniques, related Gynaecological, skin and psychatric conditions during Rehabilitation procedures and Prosthetics & Orthotics (P&O) Care. Sound knowledge of radiology and ultra sound
	DEMONSTRATION / PRACTICAL Trauma Life Support procedures in support of stabilization like RTA, Burn and emergency care, Earth quack, and other accident cases. Intra muscular and intra venous injection procedures, Setting and removing of drips. Drill training during emergency situation. Closed chest cardiac massage. Open chest cardiac massage Management of oxygen therapy and ventilators Incision and drainage of abscess, hematoma, Wound debridement Preservation of served extremities Application and removal of splints and casts. Closed reduction of dislocated joints .Use of emergency immobilization and traction techniques

Text BOOKS:

Sl. No	Title	Author	Edition	Year of pub.
1.	Goodman & Gilman's The Pharmacological Basis of Therapeutics	Laurence Bruton	11th	2006
2.	Goodman &Gilman's The Pharmacological Basis of Therapeutics	LaurenceBrunton	12th	2011
3.	Principles of Pharmacology of Basic Concept &Clinical Applications	MonsonPaulL		1995
4.	Basic &Clinical Pharmacology	BertramG.Katzung	11th	2009
5.	Basic &ClinicalPharmacology	Bertran G Katzang, Su sanB Masters AnthonyJ.Trearor	11th	2010
6.	Basic &Clinical Pharmacology	BertranGKatzang, Su sanB Masters AnthonyJ. Tr earor	12th	2015
7.	Cardiovascular Pharmacology& Therapeutics	BramahN.Singh etal		1994
8.	Rang& Dales Pharmacology	HP Rang	6th	2007

9.	Rang &Dale	HP Rang,M M Dale,Jm Ritter, RJFlower	6th	2007
10.	Rang& Dales Pharmacology	HP Rang,M M Dale,Jm Ritter, RJFlower	7th	2012
11.	Principles of Pharmacology The Pathophysiologic basis of drug therapy(with scratch codes	David E GolanArmen M Tashjian.JrEhrin JArmstron April Armstrong	3rd	2012
13.	Modern Pharmacology with Clinical Applications	Charles R Craig Robert E Stitzel	6th	2012
14.	Modern Pharmacology	Charles R Craig RobertEStitzel	4th	1994

Year : 2	
Subject	**ORTHOPAEDICS, AMPUTATION SURGERY AND Diagnostic skills**
Code	**BPO 203**
Teaching Hours : 60	**Theory : 60**
Total Credits : 02	**Theory : 02**
Course Description	In this unit the students learns about the various orthopedic conditions in detail with review of the disabling conditions. It also covers the various common surgical techniques and its influences in the orthotics and prosthetics fit and design.
Learning objectives	● *Understand different clinical conditions that may indirectly impact on the clients' ability to successfully rehabilitate using the device.* ● *Explain the management of different disabling conditions.* ● *Explain the principles of amputations and revision amputation, types and techniques!* ● *Explain the postoperative care of the stump and stump hygiene* ● *Describe the stump dermatology and the common skin diseases and management.* ● *Describe and fabricate the postoperative fitting in the lower extremity.* ● *Describe common surgical technique and how they may influence prosthetics and Orthotics fit and design*
Learning outcomes	● Students will be able to identify various clinical conditions such as diabetes, peripheral vascular disease, and neurological disorders that may affect a client's rehabilitation process with prosthetic devices. ● Students will analyze how these clinical conditions influence the rehabilitation process, considering factors such as wound healing,

	vascular health, and neuropathy. ● Students will be proficient in discussing the management strategies for a range of disabling conditions including traumatic injuries, congenital anomalies, and degenerative diseases. ● Students will evaluate various treatment modalities including surgical interventions, physical therapy, and assistive devices to optimize function and quality of life for individuals with disabling conditions. ● Students will demonstrate a comprehensive understanding of the principles underlying amputations, including indications, surgical techniques, and potential complications. ● Students will differentiate between various types of amputations (e.g., transmetatarsal, transtibial, transfemoral) and revision amputation procedures. ● Students will articulate the importance of postoperative care in promoting optimal healing and function of the residual limb. ● Students will describe specific postoperative care protocols, including wound care, edema management, and proper stump hygiene practices. ● Students will identify common dermatological conditions affecting residual limbs, such as pressure sores, fungal infections, and dermatitis. ● Students will propose appropriate management strategies for these conditions, considering factors such as skin integrity, prosthetic fit, and patient comfort. ● Students will demonstrate proficiency in the fabrication and fitting of postoperative prosthetic devices for the lower extremity. ● Students will apply knowledge of biomechanics, anatomy, and materials science to design and customize prosthetic devices that optimize function and comfort for individual patients. ● Students will analyze various surgical techniques (e.g., myoplasty, myodesis, osseointegration) commonly used in amputation and limb salvage procedures. ● Students will evaluate how these surgical techniques impact prosthetic and orthotic fit, alignment, and function, and propose appropriate modifications to optimize device performance for individual patients.
Theory (60 Hours)	General Orthopaedics: Introduction, Principles of Orthopaedics, Common Investigative Procedures. Traumatology: Fracture - Definition, Types, Signs and Symptoms, and Management. Subluxation/Dislocations - Definition, Signs and Symptoms, Management. Inflammatory and Degenerative Conditions: Osteomyelitis, Arthritis, and Arthroses, e.g., Inflammation of Joints, Rheumatoid

	Arthritis, Infective Arthritis, Tuberculosis Arthritis, Osteoarthritis, Ankylosing Spondylitis, Arthritis of Hemophilic Joints, Neuropathic Joints. Inflammation of Tendon Sheath and Bursa. Diseases of Bones and Joints: Metabolic Diseases of Bones, e.g., Rickets, Osteomalacia, Osteopenia, Osteoporosis, Gout, Scurvy, etc. Congenital Deformities: Outline of Torticollis, Spina Bifida, Spinal Anomalies, Scoliosis, C.T.E.V. Acquired Deformities: Scoliosis - All Types, Kyphosis, Lordosis, Spondylosis, Coxa Vara, Coxa Valga, and Coxa Magna, Otto Pelvis, Genu Valgus, Genu Varum, Genu Recurvatum. Cervical and Lumbar Pathology, Prolapse of Intervertebral Disc, Spinal Cord Injury. Regional Conditions: Definition, Clinical Features, and Management of the Following Regional Conditions. Hip: Outline of Dislocations and Subluxations & Dysplasia (Congenital, Traumatic, Pathological, Paralytic, Spastic, and Central). Knee: Outline of Meniscal Tears, Dislocation of Patella, Ligamentous Injuries. Ankle & Foot: Outline of Partial and Total Ligamentous Injuries, Sprain, Heel and Foot Deformities (Calcaneovarus, Pes Valgus, Varus, Metatarsalgia, Plantar Fasciitis, Anesthetic Feet, Bunion Toe, Hallux Valgus). Shoulder: Outline of Recurrent Dislocation, Bicipital Tendinitis, and Periarthritis. Elbow and Forearm: Outline of Cubitus Varus and Valgus, Madelung's Deformity, Tennis Elbow, Volkmann's Contracture, Dupuytren's Disease, De Quervain's Disease, Entrapment Neuropathies. Wrist & Hand: Wrist Drop, Tenosynovitis, Mallet Finger, Carpal Tunnel Syndrome, Claw Hand. Specific Disorders: Leprosy, Burns, Tumors - Benign & Malignant, Tuberculosis & Perthes's Disease, AVN (Full), Peripheral Nerve Injuries, Congenital Anomalies, Muscular Dystrophy, etc. Sports Injuries and Their Management. Amputation Surgery: Indications/Causes, General Principles, Types of Amputation, i.e., Guillotine Flap, Osteoplastic Myoplastic, Osteomyoplastic. Individual Preparation for Prosthesis, Ideal Stump. Preoperative, Operative, and Postoperative Prosthetic Management Techniques in General. Amputation Surgery in Lower and Upper Limbs, Stump Refashioning, and Amputation Revision. Amputation in Special Circumstances, like in Infants and Children, Congenital Limb Deficiencies and Its Universal Classification, Ischemic Limbs,

	Elderly Persons, Malignancy, and Diabetes. Osteointegration and Osteogenesis Imperfecta. Congenital Anomalies, Podiatry, Burns. Different Imaging Techniques - X-ray, Sonography, CT Scan & MRI. Surface Anatomy and Osteology. Demonstration of Amputation Surgery.

Text Books and Journals

SL NO.	AUTHOR	TITLE	PUBLISHER	YEAR/ VOL
1.	Adam,s	Outline of orthopaedics		
2.	Solomon, Louis	Apley's Systems of Orthopedics and Fracture	Arnold, London	
3.	Maheshwari, J	Essential Orthopedics		
4.	Terke, Samual L.	Orthopedics: principles and their application	Lippencott, New York	
5.	Miroslow Vitali	Amputation & Prosthesis		

Year : 2		
Subject	**Assistive Technology**	
Code	**BPO 204**	
Teaching Hours : 60	**Theory : 60**	**Practical : Practical paper given separate in Subject Code 253**
Total Credits : 02	**Theory : 02**	
Course Description	Students would acquire knowledge and skills about the prescription, fit and use of various types of mobility assistive products, self-care assistive products, developmental aids and molded seat required for people in need through International Classification Function (ICF) approach	
Learning objectives	● At the end of the course, students will be able to ● Explain the prescription, fitting process and user training of commonly used mobility assistive products like crutches, walking stick, and walkers following ICF model. ● Assess and prescribe the best possible mobility solution for a wheelchair user ● Carry out repair and maintenance of wheelchair ● Describe various modifications in wheelchairs ● Train users to make the best use of their wheelchair including handling, mobility skills, transfers, repairs, care & maintenance. ● Prescribe, fit and train of use of developmental aids ● Describe the analysis of gait with the related mobility assistive products. ● Carry out select, fit, train and follow up for simple assistive devices for people with Vision, hearing, communication and	

	cognitive difficulties.
Learning outcomes	• Students will be able to articulate the importance of considering the International Classification of Functioning, Disability, and Health (ICF) model in the prescription and fitting process of mobility assistive devices. • Students will demonstrate proficiency in assessing individual client needs, selecting appropriate assistive products, and providing comprehensive user training to optimize functionality and promote independence. • Students will conduct thorough assessments of wheelchair users, considering factors such as physical abilities, lifestyle, and environmental barriers. • Students will develop personalized wheelchair prescriptions, selecting appropriate types, sizes, and configurations to meet individual needs and preferences. • Students will demonstrate competency in diagnosing common wheelchair problems and performing routine maintenance tasks, including tire replacement, brake adjustment, and frame repair. • Students will implement best practices for wheelchair maintenance to ensure safety, reliability, and longevity of equipment. • Students will identify common wheelchair modifications such as seating systems, positioning accessories, and adaptive controls. • Students will explain the purpose and benefits of each modification, considering factors such as postural support, pressure relief, and functional accessibility. • Students will provide comprehensive training to wheelchair users on proper handling techniques, mobility skills, and transfer maneuvers to enhance independence and safety. • Students will educate users on basic wheelchair repairs, care, and maintenance procedures, empowering them to troubleshoot common issues and optimize equipment performance. • Students will assess developmental needs and prescribe appropriate developmental • aids to enhance functional skills and independence. • Students will fit and adjust developmental aids such as adaptive toys, communication devices, and sensory equipment, providing training and support to facilitate skill development. • Students will analyze gait patterns and biomechanical considerations associated with different mobility assistive products, including crutches, walking sticks, walkers, and wheelchairs. • Students will apply principles of gait analysis to optimize device selection, fitting, and user training, promoting optimal mobility and minimizing biomechanical stress. • Students will evaluate the functional needs of individuals with

	vision, hearing, communication, and cognitive impairments and select appropriate assistive devices to enhance independence and participation. ● Students will demonstrate proficiency in fitting, training, and providing ongoing support for simple assistive devices such as magnifiers, hearing aids, communication boards, and cognitive aids, ensuring optimal use and effectiveness.
Theory (60 Hours)	Mobility Assistive products – Walking Aids Walking aids: Types & Features White Cane, Walking Sticks-Single, Tripod, Quadripod, Crutches - Axillary, Elbow and Gutter crutches. Types of Walking Frame and their attachments. Para podium etc. Prescription and fitting of walking aids Gait Training with various walking aids, Installation/ fabrication of Parallel bars. Mobility Assistive Products-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, Customized wheelchair, Care & Maintenance of Wheelchairs and importance of wheelchair user instructions. Cushions and its fabrication technique & wheelchair basic modification.Other types: Introduction: Basic orientation on Power wheelchair, tricycle and motorized tricycle, modified two wheelers for mobility. Robotics Arms. 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. Self-care assistive products ● Who needs self-care assistive products ● Common problems of people in need

	• Types and features of self care devices Prescription, fitting and user training of toilet and shower chair Other simple assistive devices: Essential simple assistive devices for people with vision, hearing, communication and cognitive difficulties.

TEXT BOOKS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Special seating An illustrated guide	Jean Anne Zollars, Male,PT	Prickly pear publication	2010/ Revised edition
2.	Fundamentals in Assistive technologies	Michellie.L. Lange, OTR, ABDA,ATP.	Rehabilitation engineering on Assistive technology society of north America	2008/4th edition
3.	Spinal cord medicine	Steve krishblum M.D.	Lippncot Williams and Wilkins	2nd edition/2002
4.	Getting to know cerebral palsy	Team of CBM project	LSHTM, London UK	2015/ original version
5.	Occupational therapy practice skills for physical dysfunction	Lorraine Williams pedrette, MS, OTR	Mosby/ Elsevier	4th edition
6.	Assistive technology principles and practice	Cook and Hussey	Mosby/ Elsevier	3rd edition
7.	Assistive technology assessment hand book	Stefano federici and Marcia. j. scherer	Taylor and francis	2012
8.	Occupational therapy for physical dysfunction	Catherine A. Trombly	Group LLC	5th Edition

Year : 2	
Subject	**Neurosciences, Physical & functional assessment**
Code	**BPO 205**
Teaching Hours : 90	**Theory : 90**
Total Credits : 03	**Theory : 03**
Course Description	This course provides a thorough understanding of neurosciences, physical assessment, and functional evaluation methods crucial for patient care and device prescription. Students learn through theory and practice to address diverse needs of individuals with physical disabilities. Topics include neuroanatomy, movement control, physical examinations, and functional assessments. Emphasis is on evidence-based practice, critical thinking, and interdisciplinary collaboration.

	By course end, students gain proficiency in conducting comprehensive assessments, preparing them for quality care in Prosthetics and Orthotics.
Learning objectives	• *Students should demonstrate a proficiency of the structure and function of the nervous system at various levels of organization.* • *Students should develop critical thinking skills to formulate scientific questions.* • *Students should understand how to construct testable hypotheses and design scientific investigations that contribute to neuroscience.* • *Students should engage in laboratory investigations that focus on neuroscience.* • *Students should communicate results of scientific investigations effectively to scientific and non-scientific audiences in both the oral and written form.* • *Students should develop awareness of the philosophical, moral, and ethical issues raised by neuroscience and be able to evaluate arguments critically.*
Learning outcomes	• *Analyze and evaluate various levels of neurological patients.* • *Differentiate between various neurological conditions.* • *Be able to solve different neurological problems.* • *Apply problem solving through search for neuroscience* • *Understand the concept of patient functional assessment and evaluation* • *Apply knowledge to assess disability in locomotor and neurological conditions*
Theory (60 Hours)	Introduction to Neuroscience: General Principles of Neuroscience. NEUROANATOMY: - Introduction, Methods. - Somatic and Autonomic Nervous System and Components. - Cranial Nerves. - Spinal Cord. - Brainstem. - Cerebellum. - Diencephalon. - Cerebrum. - Basal Ganglia. - Limbic System. NEUROCHEMISTRY:

	- Synaptic Transmission. - Synapse and Brain Disorders. - Classification of Neurotransmitters and Neurotransmitter Receptors. Basic Concepts of Different Neurological Conditions: - Acute Infections of CNS: Encephalitis, Meningitis, and Poliomyelitis. - Traumatic Injury of Head & Spine. - Paraplegia. - Parkinsonism and Other Extrapyramidal Disorders. - Involuntary Movements. - Multiple Sclerosis and Other Demyelinating Diseases. - ALS (Amyotrophic Lateral Sclerosis) & Other Motor Neuron Diseases. - Diseases/Injury of Peripheral Nerves, Cranial Nerves & G.B. Syndrome. - Myasthenia Gravis. Neurological Diseases: - Diseases of Muscles like Polymyositis, Muscular Dystrophy. - Dementia. - Alzheimer's Disease. - Cerebral Palsy. - Cervical & Lumbar Spondylosis and Disc Prolapse. - Intracranial Tumors. Physical & Functional Assessment: - Problem-Oriented Medical Record - History, Concept & Advantages. - Communication with Patient - Principles, Methods, and Types. - Physical Approach Based on Functional Assessment - Musculoskeletal System, Neural Tension Test - Normal & Abnormal Findings, Neuro-Muscular System. - Clinical Decision-Making. - Rationale of Plan of Rehabilitation Management. - Special Orthopedic Tests Commonly Used in the Clinical Setting. - Principles & Methods of Assessment & Variations in Testing & Recording - Joint Range of Motion, Manual Muscle Testing, Muscle Tone, Coordination, Sensation, Perception & Cognition.

Text Books

SL NO.	TITLE	AUTHOR	PUBLISHER	YEAR/ VOL
1.	Neuroscience (Exploring The Brain)	Mark F. Bear,Barry W. Conners. Micheal A. Paradiso	Wolters Kluwer	4th ed
2.	Clinical Neuroanatomy and Neuroscience	Estdmih Mtui,Gregory Gruener, Peter Dockery		7the d.
3.	Introduction to Neuroscience	Valerie Hedges,PH. D.		
4.	Cognitive Neuroscience	Marie T. Banich, Rebecca J. Compton		4th ed.
5.	Foundation of Neuroscience	Casey Henley, Phd		1st ed
6.	Functional Assessment and Outcome Measures for the Rehabilitation Health Professional	Sharon S. Dittmar,Glen E. Greaham	Pro Ed.	1st Jan 2005
7.	Physical Rehabilitation	Susan B. O'Sullivan,Thomas j. Scmhmitz	Jaypee	7th ed.
8.	Basics of Functional Outcome and Measurements Scales	Nikhil Mathur	Scientific Publisher	22ed Fed. 2013
9.	Orthopedic Physical Assessment	David J. Magee		6th ed.
10.	Functional Asessment and Program Development for problem behaviour (a practical handbook)	Keith Storey Robert H. Horner Jeffrey R. Sprague		3rd ed.

Year : 2		
Subject	**PROSTHETICS SCIENCE 2**	
Code	**BPO 206**	
Teaching Hours : 90	**Theory : 90**	**Practical : Practical paper given separate in Subject Code 251**
Total Credits : 03	**Theory : 03**	
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.	
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 Patient 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 health care team and identify how they interrelate with the Prosthetist and Orthotists*
Learning outcomes	● Students will demonstrate proficiency in evaluating patients through various clinical assessment strategies, including history taking and physical examination techniques. ● Students will compare different assessment methods, recognizing their strengths and limitations in diagnosing and treating patients effectively. ● Students will identify common pathologies necessitating prosthetic interventions, understanding their underlying causes, clinical manifestations, and prognoses. ● Students will develop competence in selecting and managing appropriate prosthetic devices tailored to individual patient needs and pathology characteristics. ● Students will cultivate empathy by understanding patients' unique environmental contexts and the impact of prosthetic interventions on their daily lives. ● Students will integrate prosthetics theory with patient-centered care principles, considering environmental factors to enhance treatment outcomes and patient satisfaction. ● Students will differentiate between various limb characteristics and their implications for prosthetic device design, considering factors such as residual limb shape, volume, and tissue health. ● Students will analyze how limb characteristics influence device selection, fit, and function, ensuring optimal outcomes for

	patients. ● Students will analyze temporospatial and kinematic parameters of gait in both normal and pathological conditions, understanding how deviations impact functional mobility. ● Students will apply knowledge of gait analysis to justify the selection and design of prosthetic devices tailored to individual gait abnormalities and functional goals. ● Students will discuss biomechanical force systems and their relevance to prosthetic prescription, considering factors such as load distribution, joint alignment, and energy expenditure. ● Students will apply biomechanical principles to formulate prosthetic prescriptions that optimize comfort, stability, and functional performance for patients. ● Students will describe the mechanical properties of materials used in prosthetic and orthotic devices, including strength, stiffness, and durability. ● Students will apply knowledge of material mechanics to select appropriate materials and fabrication techniques for designing and constructing prosthetic and orthotic devices. ● Students will compare and contrast the functional attributes of various prosthetic components, including joints, sockets, and suspension systems. ● Students will evaluate the performance characteristics of prosthetic components to inform device selection and customization based on patient needs and preferences. ● Students will demonstrate proficiency in formulating prosthetic and orthotic prescriptions tailored to diverse clinical scenarios, considering patient goals, functional abilities, and anatomical considerations. ● Students will apply critical thinking skills to analyze clinical data and recommend optimal device solutions that enhance patient independence and quality of life. ● Students will understand the roles of various healthcare team members, including physicians, physical therapists, and occupational therapists, in the rehabilitation process. ● Students will recognize the collaborative nature of patient care and how prosthetists and orthotists interact with other healthcare professionals to provide comprehensive and coordinated treatment plans for patients.
Theory (90 Hours)	Upper Limb: - Grasp Patterns and Forces - Mechanical Replacement of Hand Function - Augmentation of Deficient Hand Function - Upper Limb Prosthetic Socket Biomechanics - All Types

	Control Systems: - Introduction to Control Theory - Application in Prosthetics of Functional Electrical Stimulation (FES), Myoelectric, and Biofeedback Upper Limb Prosthetics: - Historical Development in Upper Limb Prostheses - India and Abroad - Upper Extremity Prosthetic Components: - Terminal Devices - Wrist Units - Elbow Units - Shoulder Units - Harnessing Systems in Upper Extremity Prosthesis Partial Hand Prosthetics: - Passive, Cosmetic, and Functional Types, including Silicon Prostheses - Cosmetic Hand Gloves and Fingers - Devices for Augmentation of Function and Cosmesis for Partial Hand and Finger Amputation Wrist Disarticulation: - Prescription Criteria - Types of Prosthesis - Components, Socket Shape - Clinical Considerations - Casting and Measurement Techniques - Cast Modifications - Fabrication Techniques - Alignment Techniques - Harnessing and Suspension Mechanisms - Fitting, Donning, and Doffing Techniques - Checkout Procedures - Testing and Training Trans Radial Prosthetics: - Prescription Criteria - Types of Prosthesis - Components, Types of Socket - Clinical Considerations - Casting and Measurement Techniques - Cast Modifications - Fabrication Techniques - Alignment Techniques - Harnessing and Suspension Mechanisms - Control System - Body Powered and Externally Powered

	- Fitting, Donning, and Doffing Techniques - Checkout Procedures - Testing and Training Trans Humeral Prosthetics: - Prescription Criteria - Types of Prosthesis, including Elbow Disarticulation Prostheses - Components - Types of Socket - Clinical Considerations - Casting and Measurement Techniques - Cast Modifications - Fabrication Techniques - Alignment Techniques - Harnessing and Suspension Mechanisms - Control System - Body Powered and Externally Powered - Fitting, Donning, and Doffing Techniques - Checkout Procedures - Testing and Training Shoulder Disarticulation Prosthetics: - Prescription Criteria - Types of Prosthesis - Cosmetics and Functional - Components - Different Types of Elbow and Shoulder Mechanisms - Types of Socket - Clinical Considerations - Casting and Measurement Techniques - Cast Modifications - Fabrication Techniques - Alignment Techniques - Harnessing and Suspension Mechanisms - Control System - Body Powered and Externally Powered Cosmetic Restoration: - Introduction to Cosmetic Restoration Silicone Prosthesis - Materials for Cosmetic Restoration Prosthesis - Assessment, Fabrication, and Fitment of Silicone Prosthesis for Fingers, Toes, Partial Foot Prosthesis, Partial Hand Prosthesis

Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol./ Edition
1	American Academy of Orthopaedic Surgeons	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5TH ed.
2	Shurr. G. Donald & J. W. Michel	Prosthetics & Orthotics		2nd ed.
3	C.A.Hannesseg	Maintenance and care of the prosthesis		
4	William R.SANTASHI Edn	Manual for Upper Extremity Prosthesis		1952
5	American Academy of Prosthetists & Orthotis ts	Powered upper limb prosthesis		
6	Mark H Bussell	New Advances in Prosthetics and Orthotics		
7	E.F.Murphy	Principal in Prosthetic management for Multiple handicapped		
8	Seymour, Ron	Prosthetics & Orthotics Lower Limb & Spine		14 feb. 2002

Year : 2		
Subject	**ORTHOTICS SCIENCE 2**	
Code	**BPO 207**	
Teaching Hours : 120	**Theory : 120**	**Practical : Practical paper given separate in Subject Code 253**
Total Credits : 04	**Theory : 04**	
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	
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 patient 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 health care team and identify how they interrelate with the Prosthetist &Orthotist.*
Learning outcomes	● *Students will analyze and evaluate various clinical assessment strategies, comparing their effectiveness in diagnosing and treating patients.* ● *Students will demonstrate proficiency in conducting thorough patient assessments, utilizing appropriate investigative techniques such as history taking and physical examination.* ● *Students will identify common pathologies necessitating orthotic interventions, understanding their underlying causes, clinical manifestations, and prognoses.* ● *Students will develop competence in recognizing and describing the signs and symptoms of these pathologies, as well as selecting and managing appropriate orthotic devices.* ● *Students will exhibit empathy by understanding the environmental context in which patients with orthotic needs live and function.* ● *Students will integrate orthotic theory with patient-centered care principles, considering environmental factors to optimize treatment outcomes and patient satisfaction.* ● *Students will differentiate between various limb characteristics and their implications for orthotic device design, considering factors such as limb shape, size, and tissue integrity.* ● *Students will analyze how limb characteristics influence orthotic device selection, fit, and function to ensure optimal outcomes for*

	patients. ● *Students will describe and compare temperospatial and kinematic parameters of gait in both normal and pathological conditions.* ● *Students will apply knowledge of gait analysis to justify the selection and design of orthotic devices tailored to individual gait abnormalities and functional goals.* ● *Students will discuss biomechanical force systems and their relevance to orthotic prescription, considering factors such as load distribution, joint alignment, and energy transfer.* ● *Students will apply biomechanical principles to formulate orthotic prescriptions that optimize support, alignment, and functional performance for patients.* ● *Students will describe the mechanical properties of materials used in orthotic devices, including strength, flexibility, and durability.* ● *Students will apply knowledge of material mechanics to select appropriate materials and fabrication techniques for designing and constructing orthotic devices.* ● *Students will compare and contrast the functional attributes of various orthotic components, including braces, supports, and splints.* ● *Students will evaluate the performance characteristics of orthotic components to inform device selection and customization based on patient needs and preferences.* ● *Students will demonstrate proficiency in formulating orthotic prescriptions tailored to diverse clinical scenarios, considering patient characteristics, functional goals, and anatomical considerations.* ● *Students will apply critical thinking skills to analyze clinical data and recommend optimal orthotic solutions that enhance patient mobility and quality of life.* ● *Students will understand the roles of various healthcare team members, including physicians, physical therapists, and occupational therapists, in the rehabilitation process.* ● *Students will recognize the collaborative nature of patient care and understand how prosthetists and orthotists work with other healthcare professionals to provide comprehensive treatment plans for patients*
Theory (120 Hours)	Control Systems: - Introduction to Control Theory - Application of Functional Electrical Stimulation (FES) in Orthotics - Hybrid Orthosis

	Upper Limb Orthotics: - Objectives of Splinting and Principles - Types & Classification of Orthoses - Biomechanical Principles of All Types of Upper Limb Orthotics - Materials Used and Their Advantages and Disadvantages - All Types of Hand Orthoses, Wrist Hand Orthoses, Elbow Orthoses, Shoulder Elbow Wrist Hand Orthoses & Pelvic Shoulder Elbow Wrist Hand Orthosis - Measurement/Casting and Fabrication of P.S.E.W.H.O, S.E.W.H.O, Elbow Orthoses, Elbow Wrist and Hand Orthoses, Elbow Braces, etc. - Orthotic Management of Rheumatoid Arthritis and Burns, etc. - Immobilization/Mobilization - Appliances for Flail Elbows - Measurement/Casting and Fabrication of Shoulder Orthoses - The Shoulder Joint Braces and Splints - Abduction Splints and Braces - Traction Splint of Humerus - All Types of Shoulder Elbow Wrist and Hand Orthoses, including both Body Powered and Externally Powered - All Types of Fracture Orthoses - Temporary Splinting - Feeder and Other Assistive Appliances Upper Limb: - Orthosis Biomechanics - Application of External Power - Myoelectric Control of External Power and Usage of Devices Basic Introduction to Spinal Orthoses: - Historical Development of Spinal Orthoses - Anatomical and Physiological Principles of Construction and Fitting of Spinal Orthoses - Biomechanical Principles and Functions of Spinal Orthoses - Indications and Contraindications for Spinal Orthosis - Sacral and Coccyx Orthosis - Lumbo Sacral Orthoses: Principle, Material, Measurement/Casting, Fabrication of All Types of Lumbosacral Orthoses (LSO), Especially Corsets and All Types of Orthoses for Lordosis and Scoliosis - Pelvic Traction and Its Uses - Cranial Orthoses - Orthotic Management of Spinal Deformities/Injuries - Orthotic Management of Pott’s Spine

	Thoraco-Lumbo-Sacral Orthoses: - Flexible Spinal Orthoses - Rigid Spinal Orthoses - Principle, Material, Measurement/Casting, Fabrication of All Types of Thoraco Lumbo Sacral Orthoses (TLSO), Especially All Types of Orthoses for Scoliosis & Kyphosis - All Types of Underarm Orthoses and Variants - Various Types of Immobilizers - Fitting, Donning, and Doffing Techniques - Checkout Procedures - Testing and Training Cervical Orthoses: - Principle, Material, Measurement/Casting, Fabrication of All Types of Cervical Orthoses, Especially Different Types of Cervical Collar, Semi-Rigid/Rigid Cervical Orthoses, Both Temporary and Permanent - Cervical Traction - HALO Traction and Various Types Different Types of Corrective Spinal Orthosis: - Boston Brace - Gensingen Brace - NYOH Brace - Milwaukee Brace - Providence Brace - Other Corrective Spinal Braces

Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol ./ Edition
1	Hsu, John D.	AAOS atlas of Orthosis and assistive devices,	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
2	Michelle M. Lusardi PhD PT And Caroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation		3rd ed.
3	Deborah A. Nawocze	Orthotics In Functional Rehabilitation on of the Lower Limb		10th aprl,1997
4	Fess,Gettle,Phil ips ElaineEwing,Ka ranS, Cynthia A	Hand and Upper Extremity Splinting : principles and methods	Elsevier Mosby St. Luis B. I. Publications P	3rd ed.

5	Anderson, Miles H.	Upper Extremity Orthotics	Jaypee Publisher New Delhi	1st Dec 1979
6	Shurr. G. Donald&J.W.Mi chel	Prosthetics & Orthotics		2nd ed.
7	Edestein, Joan E.	Orthotics	Jaypee Publisher New Delhi	1st jan 2004
8	Mark H Bussell	New Advances in Prosthetics and Orthotics		
9	Jan Bruckner and Joan Edelstein	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM		26 th aug ,2003
10	KentonD.Leathe rman Rober A. Dickson	The Management of Spinal deformities	Butter worth Heinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	
11	Seymour, Ron	Prosthetics & Orthotics LowerLimb& Spine		2002

JOURNALS

- Journal of Prosthetics and Orthotics
- Gait & posture
- Clinical Prosthetics & Orthotics (CPO)
- Journal of the Association of Children's Prosthetic Orthotic Clinics (JACPOC/ICIB)
- Artificial Limbs: A Review of Current Developments
- Prosthetics and Orthotics International

Year : 2		
Subject	**PROSTHETICS SCIENCE 2 - PRACTICAL**	
Code	**BPO 251**	
Teaching Hours : 210	**Theory : Theory paper given separate in Subject Code 206**	**Practical : 210**
Total Credits : 07		**Practical : 07**
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.	
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 component 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 tramlines.* ● *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 patient / 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*
Learning outcomes	● *Conduct a comprehensive assessment of a patient's medical condition related to orthotic or prosthetic management using appropriate investigative techniques, including patient history taking and clinical testing* ● *Formulate an optimal prosthetic solution by synthesizing information from patient assessments, collaboration with the rehabilitation team, and review of medical charts* ● *Facilitate effective communication with patients, colleagues, and other members of the rehabilitation team to discuss patient goals, expectations, and prosthetic management options* ● *Demonstrate proficiency in reliably measuring and capturing a positive cast or image of clients' appendages, ensuring correct positioning and application of necessary corrective force systems* ● *Identify, prescribe, and justify the selection of appropriate*

	materials and components in the construction of orthotic or prosthetic devices ● *Utilize appropriate fabrication techniques to construct orthotic or prosthetic devices in preparation for the initial fitting* ● *Fit orthotic or prosthetic devices to patients using static and dynamic functional criteria established during the original assessment* ● *Evaluate the quality of device fit, ensuring appropriate interface contouring, force application, and tramlines* ● *Identify and troubleshoot problems related to device fit and alignment, and implement appropriate corrections* ● *Assess and address prosthetic problems as part of long-term patient care, ensuring continuity and effectiveness of treatment.* ● *Maintain accurate records of patient treatment and follow-up, ensuring confidentiality of patient information* ● *Communicate effectively with patients, colleagues, and other healthcare professionals to provide high-quality service and maintain a professional attitude* ● *Educate patients, clients, and/or caregivers on the use, care, and function of orthotic or prosthetic devices* ● *Understand and apply a methodology of problem identification and problem-solving that involves all stakeholders, with the client at the center of decision-making processes*
Practical (210 Hours)	Assessment, Casting & Fabrication of Partial Hand Prosthesis: 1. Assessment: - Evaluate the residual limb for shape, size, and functional capabilities. - Assess the patient's goals, lifestyle, and preferences. - Determine the level of amputation and any specific requirements for the prosthesis. 2. Casting: - Use appropriate casting materials to create a mold of the residual hand. - Ensure proper positioning of the hand during casting to capture accurate contours. - Take measurements of the residual hand to guide fabrication. 3. Fabrication: - Construct the prosthetic device using durable and lightweight materials. - Customize the prosthesis to match the patient's skin tone and desired appearance. - Integrate functional components, such as grasp mechanisms,

	based on the patient's needs. - Ensure proper alignment and fit during fabrication to optimize function and comfort. Assessment, Casting & Fabrication of Wrist Disarticulation Prosthesis: 1. Assessment: - Evaluate the residual limb, wrist joint mobility, and functional requirements. - Consider the patient's lifestyle, occupation, and cosmetic preferences. - Assess any specific challenges or limitations related to the wrist disarticulation. 2. Casting: - Use appropriate techniques to capture the shape and dimensions of the residual limb and wrist joint. - Ensure proper positioning and alignment during casting to facilitate optimal prosthetic fit and function. 3. Fabrication: - Construct the prosthetic socket to provide comfortable and secure suspension. - Incorporate components for wrist motion and control based on the patient's needs. - Customize the appearance of the prosthesis to match the patient's natural limb and skin tone. - Perform thorough fitting and alignment adjustments to ensure functionality and comfort. Assessment, Casting & Fabrication of Different Levels of Transhumeral Prosthesis: 1. Assessment: - Evaluate the residual limb length, muscle strength, and range of motion. - Consider the patient's functional requirements and desired activities. - Assess any specific challenges or limitations associated with transhumeral amputation. 2. Casting: - Use appropriate techniques to capture the shape and dimensions of the residual limb, including the humeral condyles. - Ensure proper positioning and alignment during casting to facilitate optimal socket fit and suspension.

	3. Fabrication: - Construct the prosthetic socket to provide comfortable and secure suspension while accommodating the humeral anatomy. - Integrate components for elbow motion, forearm rotation, and terminal device control based on the patient's needs. - Customize the appearance of the prosthesis to match the patient's natural limb and skin tone. - Perform thorough fitting and alignment adjustments to optimize functionality and comfort. Assessment, Casting & Fabrication of Different Levels of Shoulder Disarticulation Prosthesis: 1. Assessment: - Evaluate the residual limb length, shoulder mobility, and functional capabilities. - Consider the patient's lifestyle, activities, and cosmetic preferences. - Assess any specific challenges or limitations related to shoulder disarticulation. 2. Casting: - Use appropriate techniques to capture the shape and dimensions of the residual limb, including the shoulder contour. - Ensure proper positioning and alignment during casting to facilitate optimal socket fit and suspension. 3. Fabrication: - Construct the prosthetic socket to provide comfortable and secure suspension while accommodating the shoulder anatomy. - Integrate components for shoulder motion, elbow control, and terminal device manipulation based on the patient's needs. - Customize the appearance of the prosthesis to match the patient's natural limb and skin tone. - Perform thorough fitting and alignment adjustments to optimize functionality and comfort. Silicone Prosthesis for Partial Hand Amputation, Partial Foot Amputation, Digit Amputation, Ray Amputation: - Assessment: - Evaluate the residual limb or amputated area to determine the size, shape, and tissue characteristics. - Consider the patient's functional needs, cosmetic preferences, and desired appearance.

	- Casting: - Use appropriate techniques to create a mold of the residual limb or amputation site. - Ensure proper positioning and alignment during casting to capture accurate contours. - Fabrication: - Construct the silicone prosthesis using a lifelike skin tone and texture to achieve a natural appearance. - Customize the prosthesis to match the patient's remaining anatomy and provide optimal function and comfort. - Perform meticulous detailing and finishing to enhance realism and aesthetics. All Types of Upper Limb Prosthetics Fabrication: - Utilize the aforementioned assessment, casting, and fabrication processes specific to each level of upper limb amputation (partial hand, wrist disarticulation, transhumeral, shoulder disarticulation). - Customize prosthetic devices based on individual patient needs, functional requirements, and aesthetic preferences. - Integrate appropriate components and materials to optimize functionality, comfort, and durability. - Ensure thorough fitting and alignment adjustments to achieve optimal prosthetic fit and function. Case Study: - Present a detailed case study involving a patient with upper limb limb loss or limb difference. - Describe the patient's medical history, amputation level, functional limitations, and goals for prosthetic intervention. - Outline the assessment, casting, and fabrication process specific to the patient's needs and prosthetic requirements. - Discuss the challenges encountered during prosthetic fitting and adjustment, as well as the outcomes achieved. - Provide insights into the patient's functional improvement, quality of life enhancements, and overall satisfaction with the prosthetic intervention.

Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol./ Edition
1	American Academy of Orthopaedic Surgeons	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5TH ed.

2	Shurr. G. Donald & J.W.Michel	Prosthetics & Orthotics		2nd ed.
3	C.A.Hannesseg	Maintenance and care of the prosthesis		
4	William R.SANTASHI Edn	Manual for Upper Extremity Prosthesis		1952
5	American Academy of Prosthetists & Orthotis ts	Powered upper limb prosthesis		
6	Mark H Bussell	New Advances in Prosthetics and Orthotics		
7	E.F.Murphy	Principal in Prosthetic management for Multiple handicapped		
8	Seymour, Ron	Prosthetics & Orthotics Lower Limb & Spine		14 feb. 2002

Year 2		
Subject	**ORTHOTICS SCIENCE 2 - PRACTICAL**	
Code	**BPO 252**	
Teaching Hours : 330	**Theory : Theory paper given separate in Subject Code 207**	**Practical : 330**
Total Credits : 11		**Practical : 11**
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.	
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 otherr 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 tramlines.* ● *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 patient / 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 patient / client at the centre.*
Learning outcomes	● *Students will utilize appropriate investigative techniques, including patient history taking and clinical testing, to assess the medical condition of patients requiring orthotic management.* ● *Students will synthesize information gathered from patient assessments, collaboration with rehabilitation team members, and medical charts to develop effective orthotic solutions tailored to individual patient needs.* ● *Students will engage in open communication with patients, colleagues, and rehabilitation team members to discuss and debate orthotic management, ensuring alignment with patient goals and expectations.* ● *Students will reliably measure and capture positive casts or images of clients' appendages, demonstrating correct positioning and application of necessary corrective force systems.* ● *Students will create the final design of orthoses through modification of positive casts or tracings of body parts, or when indicated, measure and fit prefabricated devices.* ● *Students will identify, prescribe, and justify the selection of appropriate materials and components for orthotic device construction based on patient needs and functional requirements.* ● *Students will construct orthotic devices using appropriate fabrication techniques, ensuring quality and functionality in preparation for initial fitting.* ● *Students will fit orthotic devices to patients using static and dynamic functional criteria established during the original assessment,*

	ensuring optimal interface contouring, force application, and alignment. ● *Students will evaluate the quality of device fit, identifying and addressing any issues related to interface contouring, force application, or alignment to optimize patient comfort and function.* ● *Students will identify problems related to device fit or alignment and suggest and implement appropriate corrections to improve device functionality and patient satisfaction.* ● *Students will assess and address orthotic problems as part of ongoing patient care, ensuring continuity and effectiveness of treatment interventions.* ● *Students will maintain accurate records of patient treatment and follow-up while upholding confidentiality standards to protect patient information.* ● *Students will communicate effectively with patients, colleagues, and other healthcare professionals to ensure the highest quality of service delivery and uphold professional standards.* ● *Students will educate patients and/or caregivers on the use, care, and function of orthotic devices, empowering them to effectively manage their treatment and optimize outcomes.* ● *Students will understand and apply problem-solving methodology that involves all stakeholders, with the patient/client at the center, to identify and address challenges in orthotic management.*
Practical (330 Hours)	Tracing and Layout of Different Types of Elbow and Shoulder Orthosis: 1. Elbow Orthoses: - Trace the contours of the upper arm, forearm, and elbow joint. - Design the orthosis layout to provide support and stability to the elbow while allowing for controlled motion. - Incorporate straps, hinges, and padding as needed for optimal fit and function. 2. Shoulder Orthoses: - Trace the contours of the shoulder girdle and upper arm. - Design the orthosis layout to stabilize and support the shoulder joint while allowing for controlled movement. - Include straps, pads, and adjustable components to customize fit and comfort. Tracing and Layout of Different Types of SEWHO (Shoulder Elbow Wrist Hand Orthosis): 1. Trace the contours of the shoulder, upper arm, forearm, and hand. 2. Design the orthosis layout to provide comprehensive support and stabilization from the shoulder to the hand. 3. Ensure proper alignment and fit to optimize function and comfort.

	4. Include adjustable components and padding for customization and patient comfort. Assessment and Fabrication of Dynamic Orthosis Using Different Passive and Active Materials: 1. Assessment: - Evaluate patient's functional needs, range of motion, and muscle strength. - Determine the appropriate type of dynamic orthosis based on patient goals and condition. 2. Fabrication: - Select passive materials such as springs, elastic bands, or pneumatic components for dynamic assistance. - Integrate active materials such as shape memory alloys or motorized actuators for powered assistance. - Customize the orthosis to fit the patient's anatomy and provide optimal support and assistance. - Perform thorough fitting and alignment adjustments to ensure functionality and comfort. Assessment and Fabrication of Dynamic Orthosis Using Different Muscle-Controlled EMG and Neuroprosthesis: 1. Assessment: - Evaluate patient's muscle function and control using electromyography (EMG) technology. - Determine the feasibility of using muscle-controlled neuroprosthesis for dynamic orthotic assistance. 2. Fabrication: - Design and fabricate the dynamic orthosis to interface with the patient's EMG signals and muscle activation patterns. - Integrate neuroprosthesis components such as sensors, actuators, and control systems for real-time muscle-controlled assistance. - Customize the orthosis to fit the patient's anatomy and provide optimal support and functionality. - Conduct extensive testing and calibration to ensure accurate and responsive neuroprosthetic control. Assessment, Evaluation & Fabrication of Different Types of Upper Limb and Spinal Orthoses on Model / Patients: 1. Conduct thorough assessment and evaluation of patient's anatomical and functional needs. 2. Select appropriate upper limb or spinal orthosis design based on assessment findings.

	3. Perform tracing, casting, and modification as needed to create custom-fit orthoses. 4. Fabricate the orthoses using suitable materials and components. 5. Fit the orthoses on models or patients and make necessary adjustments for comfort and functionality. Assessment, Casting, and Modification of at Least 5 Types of Different Categories Scoliosis Brace: 1. Conduct assessment and evaluation of patient's spinal curvature and functional limitations. 2. Select appropriate scoliosis brace design based on severity and type of curvature. 3. Perform tracing and casting of patient's torso to create custom-fit brace. 4. Make modifications to brace design as needed to achieve optimal spinal alignment and support. 5. Fabricate the brace using suitable materials and components. Assessment, Casting, and Fabrication of at Least 5 Types of Different Categories LS Brace (Lumbosacral Orthosis): 1. Conduct assessment and evaluation of patient's lumbar spine condition and functional needs. 2. Select appropriate LS brace design based on diagnosis and biomechanical requirements. 3. Perform tracing, casting, and modification of patient's torso to create custom-fit brace. 4. Fabricate the brace using materials and components suitable for lumbar support and stabilization. Assessment, Casting, and Fabrication of at Least 5 Types of Different Categories TLSO (Thoracolumbosacral Orthosis) and Cervical Orthosis: 1. Conduct assessment and evaluation of patient's thoracic, lumbar, and cervical spine conditions. 2. Select appropriate TLSO and cervical orthosis designs based on diagnosis and functional requirements. 3. Perform tracing, casting, and modification of patient's torso and neck to create custom-fit orthoses. 4. Fabricate the orthoses using materials and components suitable for spinal support and stabilization. Assessment, Casting, and Fabrication of at Least 5 Types of Different Categories CTLSO (Cervicothoracolumbosacral Orthosis): 1. Conduct comprehensive assessment and evaluation of patient's cervical, thoracic, lumbar, and sacral spine conditions.

	2. Select appropriate CTLSO designs based on diagnosis, spinal curvature, and functional needs. 3. Perform tracing, casting, and modification of patient's torso and neck to create custom-fit orthosis. 4. Fabricate the orthosis using materials and components suitable for comprehensive spinal support and stabilization from the cervical to sacral regions.

Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol./ Edition
1	Hsu, John D.	AAOS atlas of Orthosis and assistive devices,	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
2	Michelle M. Lusardi PhD PT And Caroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation		3rd ed.
3	Deborah A. Nawocze	Orthotics In Functional Rehabilitation of the Lower Limb		10th aprl,19 97
4	Fess,Gettle,Philips ElaineEwing,Karan S, Cynthia A	Hand and Upper Extremity Splinting : principles and methods	Elsevier Mosby St. Luis B. I. Publications P	3rd ed.
5	Anderson, Miles H.	Upper Extremity Orthotics	Jaypee Publisher New Delhi	1st Dec 1979
6	Shurr. G. Donald&J.W.Mich el	Prosthetics & Orthotics		2nd ed.
7	Edestein, Joan E.	Orthotics	Jaypee Publisher New Delhi	1st jan 2004
8	Mark H Bussell	New Advances in Prosthetics and Orthotics		
9	Jan Bruckner and Joan Edelstein	Orthotics: Individual: A Comprehensive Interactive Tutorial CD- ROM		26 th aug ,2003
10	Kenton D. Leatherm an Rober A. Dickson	The Management of Spinal deformities	Butter worth Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP	
11	Seymour, Ron	Prosthetics & Orthotics Lower Limb & Spine		2002

Year 2		
Subject	**ASSISTIVE TECHNOLOGY - PRACTICAL**	
Code	**BPO 253**	
Teaching Hours : 90	**Theory : Theory paper given separate in Subject Code 205**	**Practical : 90**
Total Credits : 03		**Practical : 03**
Course Description	Students would acquire practical skills on the provision of assistive products related to mobility & self-care following the four steps as per World Health Organisation (WHO) guidelines and available instruction in an open access online platform. The student should be able to meet the following learning objectives:	
Learning objectives	• Assessing a wheelchair user to identify the best possible mobility solution; • Providing a manual wheelchair with an appropriate cushion; • Problem solving to identify simple modifications to the wheelchair that can help to ensure the best fit; • Training of wheelchair users to make the best use of their wheelchair; Carrying out follow up; • Carry out basic wheelchair repair and maintenance; • How to fabricate a foam contoured cushion; • Assess, prescribe, fit and train the user on commonly used walking aids like crutches, walking, stick, walkers and self care devices including toilet chairs and shower chairs; • Describe the analysis of gait with the related to walking aids. • Explain the prescription of commonly used mobility aids. • Assess, prescribe and fabricate different types of developmental aids followed by fitting and train the care givers on its usage.	
Learning outcomes	• *Students will demonstrate the ability to assess wheelchair users thoroughly to identify the most suitable mobility solution based on individual needs and capabilities.* • *Students will select and provide manual wheelchairs with suitable cushions tailored to individual user requirements, ensuring optimal comfort and support.* • *Students will employ problem-solving skills to identify and implement simple modifications to wheelchairs, ensuring optimal fit and functionality for users.* • *Students will train wheelchair users on proper usage techniques, facilitating independence and safety, and conduct follow-up to address any issues and ensure continued optimal use.* • *Students will demonstrate proficiency in basic wheelchair repair and maintenance tasks, ensuring the ongoing functionality and safety of mobility devices.*	

	• *Students will learn and apply techniques for fabricating foam contoured cushions, meeting the specific comfort and support needs of individual users.* • *Students will assess, prescribe, and fit commonly used walking aids and self-care devices such as crutches, walking sticks, walkers, toilet chairs, and shower chairs, providing comprehensive training to users and caregivers.* • *Students will analyze gait patterns and biomechanical considerations related to the use of walking aids, understanding how different devices impact mobility and function.* • *Students will explain the rationale behind the prescription of commonly used mobility aids, considering factors such as user mobility, stability, and independence.* • *Students will assess, prescribe, fabricate, and fit various developmental aids, followed by comprehensive training for caregivers on their usage, promoting optimal development and quality of life for users.*
Practical (90 Hours)	Practice 8 Steps of Wheelchair Service Delivery and Carry out Simple Modifications in Wheelchair with Live Models: 1. Assessment: Evaluate the user's physical condition, mobility needs, and environment. 2. Prescription: Select the appropriate wheelchair type, size, and features based on assessment findings. 3. Funding: Assist the user in obtaining funding or reimbursement for the wheelchair. 4. Ordering: Place the order for the prescribed wheelchair with the manufacturer or supplier. 5. Fitting: Adjust the wheelchair to the user's specifications, including seat width, depth, and height. 6. Training: Provide training to the user on proper wheelchair use, maintenance, and safety. 7. Follow-up: Schedule follow-up appointments to address any issues or concerns with the wheelchair. 8. Maintenance: Educate the user on regular wheelchair maintenance and repair procedures. Practice on Provision of Walking Aids Commonly Used Through Role Play: - Demonstrate proper fitting and adjustment of walking aids such as canes, crutches, and walkers. - Role-play scenarios where users require assistance with mobility aids in various environments (e.g., home, outdoor). - Practice providing instructions on safe and efficient use of walking aids to improve user confidence and independence.

	Practice on Assessment, Prescription, and Fabrication of Various Types of Developmental Aids: - Learn assessment techniques to evaluate the needs of individuals with developmental disabilities. - Practice prescribing appropriate developmental aids such as adaptive seating, positioning devices, and sensory integration tools. - Fabricate custom developmental aids based on individual needs and specifications using appropriate materials and techniques. Design Various Types of Adaptive Devices and Practice on Provision of Toilet Chairs: - Explore the principles of adaptive device design and fabrication. - Design adaptive devices tailored to the specific needs of users, such as toilet chairs with adjustable heights, armrests, and footrests. - Practice fitting and adjusting toilet chairs to ensure proper positioning and comfort for users with mobility or toileting difficulties. - Provide training to users and caregivers on the safe and effective use of toilet chairs, including transfer techniques and hygiene maintenance.

THIRD YEAR

Year : 3	
Subject	**Research Methodology & Biostatistics**
Code	**BPO 301**
Teaching Hours : 60	**Theory : 60**
Total Credits : 02	**Theory : 02**
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.
Learning objectives	● *Explain the process, types, design, needs, 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, 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*
Learning outcomes	● *Students should be able to explain the steps involved in conducting research, including the types, design, and principles of research.* ● *Students should be able to formulate an appropriate research plan to solve a clinical problem, considering the needs and objectives of the research.* ● *Students should be proficient in estimation and hypothesis testing, with an understanding of how these concepts can be applied to population proportions, means, and variances.* ● *Students should be able to describe the process of sampling, data collection, and processing of data in a research study.* ● *Students should be skilled in examining data using various measures and performing descriptive statistical analysis and statistical inference for different applications.* ● *Students should be adept at using empirical and probability distributions to model data in a research study.* ● *Students should be capable of executing a basic research study to solve a clinical problem, demonstrating their understanding of the entire research process.*
Theory (90Hours)	Introduction & Biostatistics: - Definition of Statistics: Statistics is the science of collecting, organizing, analyzing, interpreting, and presenting data. - Definition of Biostatistics: Biostatistics is the application of statistical methods to biological, medical, and health-related data. - Branches of Statistics and Importance in Health Science: Branches include descriptive statistics (summarizing data), inferential statistics (making predictions or inferences from data), and biostatistics (applying statistical methods to health-related data). It's vital in health science for studying diseases, evaluating treatment effectiveness, and making informed decisions in public health. Variable: - Qualitative & Quantitative Variables: Qualitative variables are categorical (e.g., gender), while quantitative variables are numerical (e.g., age). - Discrete and Continuous Variables: Discrete variables have finite values (e.g., number of children), while continuous variables can take any value within a range (e.g., weight). Tabulation of Data & Tabular Presentation:

	- Tabulation of Data: Organizing data into tables for easier interpretation and analysis. - Statistical Table Format: Tables typically have titles, headings, rows, and columns to present data systematically. Frequency Distribution: - Construction of Frequency Distribution: Grouping data into intervals or classes and counting the number of observations in each interval. - Cumulative and Relative Frequency Distribution: Cumulative frequency is the sum of frequencies up to a certain point, while relative frequency is the proportion of observations in each class. - Exclusive and Inclusive Method of Classification of Data: Exclusive method does not include the upper limit of a class, while the inclusive method does. Diagrammatic Presentation of Data: - Bar Diagrams, Pie Diagram, Line Diagram, Pictogram, Cartogram: Different graphical methods to represent data visually. - Graphical Representation of Frequency Distribution: Histograms, frequency polygons, and cumulative frequency curves show the distribution of data. Measures of Central Tendency: - Mean, Median, Mode: Statistical measures to describe the center or average of a dataset. - Comparison of Mean, Median, and Mode: Each measure has its strengths and weaknesses and may be used depending on the distribution of data. Measures of Dispersion: - Range, Variance, and Standard Deviation: Measures of the spread or variability of data points around the central tendency. Probability and Standard Distributions: - Probability and Standard Distribution: Probability is the likelihood of an event occurring, and standard distributions like the binomial and normal distributions are commonly used in statistical analysis. - Divergence from Normality - Skewness, Kurtosis: Skewness measures asymmetry in the distribution, while kurtosis measures the peakedness of the distribution. Statistical Significance and Tests: - Parametric Tests (e.g., t-test) and Non-Parametric Tests (e.g., Chi-Square Test): Different tests to assess the significance of differences

	or relationships in data. - Analysis of Variance (ANOVA) and Covariance (ANCOVA): Statistical methods to compare means across different groups or conditions while controlling for other variables. Research Methodology: - Meaning of Research, Objectives, and Types of Research: Research is systematic inquiry aimed at generating knowledge. Objectives include exploration, description, explanation, and prediction. Types include descriptive, analytical, and experimental research. - Research Problem and Design: Defining research problems and selecting appropriate research designs to address them. - Sampling Design: Selecting samples from populations and determining sampling procedures. - Measurement and Scaling Techniques: Collecting data using measurement and scaling techniques, ensuring reliability and validity. - Methods of Data Collection: Gathering primary and secondary data, understanding their advantages and disadvantages. - Analysis of Data and Testing of Hypothesis: Analyzing data using appropriate statistical methods and testing hypotheses to draw conclusions. - Publication & Research Ethics: Importance of publication, ethics in research, integrity, avoiding misconduct, and adhering to publication ethics.

Text Book and Journals

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Research Methodology A Step-by-Step Guide for Beginners	Ranjit Kumar	SAGE Publications	2010
2.	Research Methods for Clinical Therapists Applied Project Design and Analysis	Carolyn Hicks	Churchill Livingstone/Elsevier	2009
3.	Physical Therapy Research Principles and Applications	Elizabeth Domholdt	Saunders	2000
4.	Introducing Research Methodology A Beginner's Guide to Doing a Research Project	Uwe Flick	SAGE Publications	2014
5.	Research Methodology Methods and Techniques	C. R. Kothari	New Age International (P) Limited	2004
6.	International Classification of Functioning, Disability and Health ICF.	World Health Organization	World Health Organization	2001

7.	Responsible Conduct of Research	Adil E. Shamoo, David B. Resnik	Oxford University Press	2009
8.	Ethical Issues in Behavioral Research Basic and Applied Perspectives	Allan J. Kimmel	Wiley	2009
9.	How to Design and Report Experiments	Andy Field, Graham Hole	SAGE Publications	2002
10.	An Introduction to Data Analysis Quantitative, Qualitative and Mixed Methods	Tiffany Bergin	SAGE Publications	2018

JOURNALS:

- International Journal of Social Research Methodology
- BMC medical research methodology
- AIJR journals

Year : 3	
Subject	**Clinical Biomechanics, Gait & Posture Analysis**
Code	**BPO 302**
Teaching Hours : 90	**Theory : 90**
Total Credits : 03	**Theory : 03**
Course Description	The understanding of Bio-mechanical principles of Prosthetics and Orthotics will be the foundation of the work of the students. It is 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.
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 temperospatial, 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.*

Learning outcomes	● Students should be able to apply the principles of tissue mechanics to explain P&O treatment, including various force systems, and demonstrate an understanding of the practical problems in prosthetics and orthotics. ● Students should be skilled in using biomechanical terminology to describe the position and motion of the human body and discuss the mechanical principles governing human motion. ● Students should be capable of utilizing temperospatial, kinematic, and kinetic information to differentiate between normal and abnormal functions in the upper limbs, lower limbs, and spine. ● Students should be adept at analyzing forces at skeletal joints for various static and dynamic activities. ● Students should be able to analyze the forces and moments applied to the body by prosthetic and orthotic devices. ● Students should be proficient in applying biomechanical principles to generate optimal solutions for clinical problems in prosthetics and orthotics. ● Students should have a grasp of the concepts of differentiation and integration and be able to evaluate derivatives and integrals of a function, which may be relevant to the analysis of biomechanical systems.
Theory (90Hours)	Posture & Gait: - Understand normal and pathological gait, including general features, initiation, kinematics, kinetics, and energy requirements. - Introduction to EMG studies and recording electromyography to analyze muscle activity during gait. Tissue Mechanics: - Gain knowledge of the mechanical characteristics and functions of bones, skin, ligaments, cartilage, and muscles. - Analyze the mechanical properties of these tissues. Joint Force Analysis: - Understand body segment parameters and joint forces during different phases of gait. - Analyze joint forces at the foot and ankle, knee, and hip joints. Human Locomotion and Gait Analysis: - Introduction to various methods of gait analysis, including force plate analysis, TV analysis, and electromyography studies. - Study energy expenditure during gait, gait repeatability, variations due to age, footwear, orthoses/prostheses. - Analyze gait deviations in trans-femoral amputees and variations due to alignment or pathological conditions.

	Through Knee Biomechanics: - Learn principles of through-knee prosthetic prescription, socket biomechanics, alignment techniques, and gait analysis. Trans Femoral Prosthetics Biomechanics: - Understand general socket biomechanics and specific biomechanics of trans-femoral sockets. - Analyze forces on trans-femoral sockets during gait and study gait patterns with trans-femoral prostheses. Gait Deviation: - Study gait deviations while using Foot Orthoses (FO), Ankle Foot Orthoses (AFO), and trans-tibial prostheses. Above Knee Orthotics Biomechanics: - Understand biomechanical principles of above-knee orthoses, including Knee Ankle Foot Orthosis (KAFO) and Floor Reaction Orthosis (FRO). - Analyze gait deviations with KAFO and HKAFO due to alignment or pathological conditions. Gait Analysis of KAFOs and HKAFOs with Various Types of Crutches: - Study gait patterns with KAFOs and HKAFOs and analyze the effects of different types of crutches on gait. Transtibial Biomechanics and Gait Analysis: - Understand socket biomechanics and alignment techniques for transtibial prostheses. - Analyze gait patterns in individuals with transtibial prostheses.

Text Book and Journals

Sl No	Title	Author	Publisher	Year/ volume
1	Human walking	Rose, Jessicaed.		
2	Kinesiology: Application to Pathological Motion	Soderberg, L.ed.	Lippincott Williams and Wilkins	1986
3	Introduction of Kinesiology, 2nd ed.	Hoffoman J. ed.	Human Kinetics Publishers	2009
4	Biomechanical Basis of Human Movement	Hamill, Joseph		
5	An Introduction to Biomechanics	D. Humphey		

6	Muscles, nerves & movement, 3rd ed.	Tyldesley, Barbara	Wiley Blackwell	1996
7	Gait analysis	Perry, Jacuelin		
8	Human body dynamics	Tozeren, Aydin		
9	Human motion analysis	Harries, G.F.ed		
10	Clinical biomechanics	Dvir, Zeevi		
11	Basic Biomechanics	Hall, Susan J	McGraw-Hill	
12	Gait disorders	Hausdorff, Alexander,Jeffrey M, Neil	McGraw-Hill	
13	Fundamentals of Biomechanics ,2nd ed.	Duane Knudson	B. I. Publications	
14	Principles of mechanics and biomechanics	Stanley Bell,P Frank		
15	Clinical Biomechanics	Black Jonathan	B. I. Publications	
16	Biomechanics of the Foot and Ankle	Donatelli, R.A. Davis, Philadelphia	Davis, Philadelphia	
17	Biomechanics of Musculoskelton System	Benno M. Nigg		Springer Nature
18	A D Manual of Fracture	Wagner Mechael		Wiley Blackwell
19	Clinical Biomechanics of Lower Limb	Ronal C Valmassy		Elsevier Health U.S
20	Biomechanics: Mechanical Properties	Y. C. Fung		Elsevier Health U.S
21	The Physics of Living Tissue	Fabrizio Cleri		Springer Nature
22	Text book of Fluid Mechanics	C. Rajput		Springer Nature
23	Biomechanics of Spine	White & Punjabi		

Year : 3	
Subject	**Public Health and Rehabilitation**
Code	**BPO 303**
Teaching Hours : 90	**Theory : 90**
Total Credits : 03	**Theory : 03**
Course Description	This course explores the intersection of public health and rehabilitation, focusing on strategies and interventions aimed at promoting health and well-being among individuals with disabilities. Students will gain a comprehensive understanding of the principles, policies, and practices that contribute to effective public health initiatives in the context of rehabilitation.
Learning objectives	• *Principles of public health and their application in promoting health and preventing disabilities.*

	• *Demonstrate an understanding of the population-based approach to healthcare.* • *Use epidemiological data to inform public health strategies for individuals with disabilities.* • *Analyse the impact of social determinants of health on individuals with disabilities.* • *Develop advocacy skills to promote inclusive and accessible environments.* • *Identify and address health disparities and inequities in vulnerable populations.* • *Identify and address ethical considerations in public health and rehabilitation practice.* • *Demonstrate cultural competence in working with diverse populations and respecting individual differences.* • *Develop skills in conveying public health messages to a broad audience.* • *Develop problem-solving and critical thinking skills in addressing public health challenges related to rehabilitation.* • *Communicate effectively with individuals with disabilities, healthcare professionals, and diverse community stakeholders.*
Learning outcomes	• *Students should be able to grasp the principles of public health and their application in promoting health and preventing disabilities.* • *Students should demonstrate an understanding of the population-based approach to healthcare and its application in various contexts.* • *Students should be skilled in using epidemiological data to inform public health strategies for individuals with disabilities.* • *Students should be capable of analyzing the impact of social determinants of health on individuals with disabilities.* • *Students should be equipped with advocacy skills to promote inclusive and accessible environments for individuals with disabilities.* • *Students should be able to identify and address health disparities and inequities in vulnerable populations.* • *Students should be aware of and able to address ethical considerations in public health and rehabilitation practice.* • *Students should exhibit cultural competence when working with diverse populations and respect individual differences.* • *Students should develop skills in conveying public health messages to a broad audience effectively.* • *Students should develop problem-solving and critical thinking skills to address public health challenges related to rehabilitation.* • *Students should be able to communicate effectively with individuals with disabilities, healthcare professionals, and diverse*

	community stakeholders.
Theory (90Hours)	Community-Based Rehabilitation (CBR) & Institutional-Based Rehabilitation (IBR): - Community Based Rehabilitation (CBR): - Explanation of CBR and its necessity in providing rehabilitation services to persons with disabilities. - Differentiating between IBR and CBR. - Overview of approaches in CBR including single disability, multi-disability, single-sectoral, and multi-sectoral approaches. - Strategies in CBR to safeguard the rights of persons with disabilities. - Adapting CBR strategies for various socio-cultural and economic conditions. - Simple knowledge about various disabilities, their prevention, and management. - Role of Prosthetics & Orthotics (P&O) Professionals in CBR. - Collaborative role of other professionals in CBR. - Teamwork principles in CBR/IBR structures. - Techniques to enhance the purposefulness of CBR activities including telemedicine. - Health Care System and Rehabilitation: - Overview of the healthcare system and rehabilitation services. - Rehabilitation initiatives under various ministries. - Introduction to IBR and CBR. - The role of CBR workers in Prosthetics & Orthotics (P&O) services. - Composition and roles within the rehabilitation team. - Legislation and Acts: - Introduction to relevant acts and legislation including the Rights of Persons with Disabilities (RPWD) Act, The Mental Health Act, and The Rehabilitation Council of India Act. - Understanding the provisions of these acts and their implications for persons with disabilities. - Schemes and Agencies: - Overview of schemes and agencies providing benefits and concessions at the state and central levels. - Examples of schemes and programs like PMAGY, NAREGA, DDRS, SIPDA, CDEIC, ADIP, ICDS, and others. - Role of microcredit groups, Self-Help Groups (SHG's), and the National Handicapped Finance and Development Corporation (NHFDC).

	- Disability Evaluation and Early Intervention: - Understanding disability types and principles of disability assessment. - Guidelines and procedures for certification of multiple disabilities. - Importance of early identification and intervention. - Barrier-free aspects and inclusive environment concepts. - Therapeutic Exercises: - Principles, techniques, and effects of therapeutic exercises. - Assessment and evaluation to plan exercise programs. - Specific techniques for joint mobility, muscle strengthening, neuromuscular coordination, and functional re-education. - Hydrotherapy, Mobilization Techniques, PNF, Traction, Breathing Exercises: - Principles and therapeutic effects of hydrotherapy. - Introduction to special mobilization and manipulation techniques. - Conceptual framework and principles of Proprioceptive Neuromuscular Facilitation (PNF). - Principles and techniques of traction and breathing exercises. - Group therapy and neuro-muscular physiology. - Electro-diagnosis techniques including EMG and Nerve Conduction Velocity. - Introduction to biofeedback principles and instrumentation.

Text Book and Journals

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Community-based Rehabilitation CBR Guidelines · Volumes 1-7	World Health Organization	World Health Organization	2013
2.	Introduction to Health Care Services: Foundations and Challenges	Bernard J. Healey, Tina Marie Evans	Wiley	2014
3.	Early Identification and Intervention A Handbook for Teachers and School Counsellors	Helga Anneliese Hildegard Rowe	Australian Council for Educational Research	2011
4.	Handbook of Early Childhood Intervention	Jack P. Shonkoff, Samuel J. Meisels	Cambridge University Press	2000
5.	Rights of Persons with Disability in India	Rumi Ahmed	White Falcon Publishing Solutions LLP	2015

6.	The United Nations Convention on the Rights of Persons with Disabilities A Commentary	Giuseppe Palmisano, Rachele Cera, Valentina Della Fina	Springer International Publishing	2017
7.	Manual of different act for persons with disabilities in India	Department of Empowerment of Persons with Disabilities	Department of Empowerment of Persons with Disabilities	
8.	Park's Textbook of Preventive and Social Medicine	K. Park	Bhanot Publishers	2017
9.	Introduction to Physical Therapy- E-BOOK	Michael A. Pagliarulo	Mosby	2007
10.	Kendall's Muscles Testing and Function with Posture and Pain	Vincent M. Conroy, Brian N. Murray Jr., Quinn T. Alexopulos, Jordan McCreary	Wolters Kluwer Health	2022
11.	Tidy's Physiotherapy	Stuart B. Porter	Elsevier	2013
12.	Principles of Exercise Therapy	Dillon Graham	Syrawood Publishing House	
13.	Introduction to Group Therapy ·	Virginia Brabender	Wiley	2002
14.	Principles of Exercise Therapy	Dillon Graham	Syrawood Publishing House	
15.	Kendall's Muscles Testing and Function with Posture and Pain	Vincent M. Conroy, Brian N. Murray Jr., Quinn T. Alexopulos, Jordan McCreary	Wolters Kluwer Health	2022
16.	Kinesiology The Mechanics and Pathomechanics of Human Movement	Carol A. Oatis	Lippincott Williams & Wilkins	2009
17.	Pedretti's Occupational Therapy Practice Skills for Physical Dysfunction	Heidi McHugh Pendleton, Winifred Schultz-Krohn	Elsevier	2018

Year : 3		
Subject	**Clinical Prosthetics and Orthotics Practice in Pediatric**	
Code	**BPO 304**	
Teaching Hours : 60	**Theory : 60**	**Practicals : Practical paper given separate in Subject Code 351**
Total Credits : 02	**Theory : 02**	
Course Description	This course is designed to provide students with the knowledge and skills required for clinical practice in the field of prosthetics and orthotics specifically tailored for paediatric patients. The course	

	integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with children who require orthotic or prosthetic devices.
Learning objectives	● Comprehensive Understanding ● Diagnostic Proficiency ● Prescription Competence ● Paediatric Specialization ● Wound Care Proficiency ● Preventive Strategies ● Interdisciplinary Collaboration ● Research and Innovation
Learning outcomes	● Students will acquire a comprehensive understanding of orthotic and prosthetic management tailored to pediatric and geriatric populations. ● Students will develop diagnostic proficiency in assessing a range of musculoskeletal and neurological conditions relevant to orthotic and prosthetic interventions. ● Students will demonstrate competence in prescribing orthotic and prosthetic devices based on thorough assessments and diagnostic criteria. ● Students will be specialized in paediatric orthotic and prosthetic care, including assessment, evaluation, and management strategies. ● Students will acquire proficiency in wound care techniques, particularly in the context of diabetes and paediatric foot care. ● Graduates will develop preventive strategies for sports-related foot injuries and cardio-pulmonary deconditioning in geriatric patients. ● Students will understand the importance of interdisciplinary collaboration in providing holistic care to paediatric and geriatric populations. ● Students will be encouraged to engage in research activities, promoting innovation in orthotic and prosthetic care for paediatric and geriatric patients.
Theory (90Hours)	Introduction to Paediatric Prosthetics and Orthotics: - Overview of the unique considerations and challenges in providing orthotic and prosthetic care to pediatric patients. - Understanding developmental stages and growth patterns in children. Assessment and Evaluation in Pediatric Practice: - Methods for assessing the orthotic and prosthetic needs of pediatric

	patients. - Considerations for assessing growth and developmental milestones. - Diagnostic tools and prescription criteria for various pediatric conditions. Orthotic Management in Pediatrics: - Addressing growth and developmental factors in orthotic management. - Management of conditions such as cerebral palsy (CP), myopathy, spina bifida, Still's disease, acute CNS infections, lung infections, clubfoot (CTEV), congenital dislocation of the hip (CDH), Erb's palsy, and arthrogryposis multiplex congenital. - Podiatric assessment, evaluation, and prescription criteria for pediatric orthotic interventions. Pediatric Prosthetics: - Overview of various prosthetic devices designed specifically for children. - Customization, fitting, alignment, and functional training for pediatric prosthetic users. - Considerations for addressing growth and developmental changes in prosthetic fittings. Ethical Considerations in Pediatric Care: - Discussion of ethical principles and considerations specific to pediatric orthotics and prosthetics practice. - Ensuring informed consent, respecting autonomy, and prioritizing the best interests of the child. Cultural Competence and Family-Centered Care: - Understanding cultural and family-specific considerations in orthotic and prosthetic care. - Importance of involving families in decision-making and treatment planning. - Ensuring culturally sensitive and inclusive practices in pediatric orthotic and prosthetic care. Emerging Technologies and Innovations: - Introduction to cutting-edge technologies and innovations in pediatric prosthetics and orthotics. - Discussion of advancements in materials, design, and manufacturing techniques tailored to pediatric patients. - Exploration of how emerging technologies can enhance outcomes and improve the quality of life for pediatric orthotic and prosthetic users.

Text Book and Journals

Sl. No.	Title	Author	Publisher	Year/Vol.
1	Pediatric Rehabilitation Principles and Practices	Michael A. Alexander, Dennis J. Matthews	demosme dical	5th ed.
2	AAOS atlas of Orthosis and assistive devices,	Hsu, John D.	Mosby publicatio ns/ or N.Y.U. St.Louice, London, Chickago	5th ed.
3	Orthotics and Prosthetics in Rehabilitation	Michelle M. Lusardi PhD PT and Caroline C. Nielsen PhD		3rd ed.
4	Pediatric Rehabilitation Principles and Practices	Kevin P. Murphy,Mary A. McMahon, Amy J. Houtrom	demosme dical	6th ed.
5	Assistive Technology Principles and Practice	Albert M. Cook,Jaan Miller Polgar,Pedro Encarnacao		5th ed.
6.	Short Testbook of Prosthetics & Orthotics	R Chinnathurai		1st ed.
7.	Fundamentals of Amputation Care And Prosthetics	Douglas Murphy		1st ed.

Year : 3		
Subject	**Clinical Prosthetic and Orthotic Practice in Surgical and Orthopedic Conditions**	
Code	**BPO 305**	
Teaching Hours : 60	**Theory : 60**	**Practical : Practical paper given separate in Subject Code 352**
Total Credits : 02	**Theory : 02**	
Course Description	This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on conditions related to surgery and orthopaedics. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with individuals who require prosthetic or orthotic devices due to surgical or orthopaedic conditions.	
Learning objectives	• *Clinical Competence:* • *Operative Proficiency:* • *Complication Management:* • *Rehabilitation Skills:* • *Multidisciplinary Collaboration:* • *Device Application:* • *Clinical Decision-Making:* • *Patient Education:*	
Learning outcomes	• *Develop the ability to clinically examine, diagnose, and recommend appropriate non-operative and operative management for a variety of orthopedic conditions.* • *Attain proficiency in understanding the principles and indications for operative treatments, including surgical interventions for fractures, dislocations, and amputations.* • *Demonstrate knowledge in preventing, identifying, and managing complications associated with fractures, dislocations, and surgical interventions.* • *Acquire skills in prosthetic and orthotic management, including the application of devices and techniques for rehabilitation in diverse orthopedic cases.* • *Develop an understanding of the collaborative approach between orthopedics, physiotherapy and prosthetics/orthotics for comprehensive patient care.* • *Demonstrate the ability to select and apply appropriate orthopedic devices, considering individual patient needs and specific conditions.* • *Enhance clinical decision-making skills through the integration of theoretical knowledge with practical application in the management of orthopaedic cases.*	

	• *Effectively communicate with patients regarding their conditions, treatment options, and the use of orthopedic devices, empowering them in their rehabilitation journey.*
Theory (60Hours)	Principles of Operative Treatment: - Indications, contraindications, and principles of: - Arthrodesis - Arthroplasty - Osteotomy - Bone grafting - Tendon transfers - Arthroscopy Sprains and Muscle Strains: - Common sites, clinical manifestations, and treatment of: - Tennis Elbow - Golfer's Elbow - De Quervain's disease - Tenovaginitis - Trigger finger - Carpal Tunnel Syndrome - Plantar Fasciitis Sports Injuries: - Classification, management, and injuries related to common sports. Amputations - Pre & Postoperative P&O Management in Fractures and Dislocations: - Types of fractures including patterns, open and closed fractures, fracture-dislocations. - Differences between dislocation and subluxation. - General and local signs and symptoms of fractures and dislocations. - Principle of management, prevention, and treatment of complications. Upper Limb Fractures & Dislocations: - Major long bone fractures and joint injuries, clinical features, principles of management, and complications. Lower Limb Fractures & Dislocations: - Major long bone fractures and joint injuries, clinical features, principles of management, and complications. Prosthetics and Orthotics in Fractures and Dislocations: - Mechanism, clinical features, principles of management, and

	complications of spinal injuries. - Recurrent dislocation: Mechanism, clinical features, principles of management, and complications of recurrent dislocation of the shoulder and patella. Bone & Joint Infections: - Etiology, clinical features, management, and complications of septic arthritis, osteomyelitis, and tuberculosis. Bone Joint Tumors: - Classification, clinical features, management, and complications of benign and malignant bone and joint tumors. Prosthetics and Orthotics in Chronic Arthritis: - Pathology, clinical features, mechanism of deformities, management, and complications of rheumatoid arthritis, osteoarthritis, and ankylosing spondylitis. P&O in Spinal and Other Deformities: - Classification of spinal deformities, clinical features, management, and complications of scoliosis, kyphosis, lordosis, and common acquired deformities of other joints. P&O in Poliomyelitis: - Pathology, prevention, management, and complications of polio, including treatment of residual paralysis and principles of muscle transfers. P&O in Congenital Deformities: - Clinical features and management of congenital deformities such as clubfoot, congenital dislocation of the hip, flat foot, vertical talus, limb deficiencies, and arthrogryposis multiplex congenita. P&O in Peripheral Nerve Injuries: - Clinical features and management, including reconstructive surgery, of various nerve lesions. Hand Injuries: - Clinical features, management, and complications of skin and soft tissue injuries, tendon injuries, and bone and joint injuries. P&O in Leprosy: - Clinical features, management, and complications of neuritis, muscle paralysis, tropic ulceration, and hand and foot deformities in leprosy.

	Degenerative & Infective Conditions: - Overview of degenerative and infective conditions such as osteoarthritis, spondylosis, spondylolisthesis, tuberculosis, and Perthe's disease. General Orthopedics: - Various orthotic devices and supportive appliances used in orthopedic rehabilitation, including footwear modifications, splints, braces, and orthotic walkers.

Text Book and Journals

Sl.No.	Title	Author	Publisher	Year/ Vol.
1	Orthopedics: principles and their application	Terke, Samual L.	Lippencot t, New York	
2	Global Orthopedics Caring for Musculoskeletal Conditions and Injuries in Austere Settings	David A. Spiegel, Michelle Foltz, Richard A. Gosselin	Springer Internatio nal Publishing	**2019**
3	Lower-limb Prosthetics and Orthotics Clinical Concepts	Joan E. Edelstein, Ale x Moroz	SLACK	**2011**
4	Prosthetics and Orthotics	Donald G. Shurr, John W. Michael, Thomas Michael Cook	Prentice Hall	**2002**
5	Standard Handbook of Biomedical Engineering and Design	Myer Kutz	McGraw- Hill	**2003**
6	Evidence-Based Orthopedics	Mohit Bhandari	wiley	2021
7	ABC of Orthopaedics and Trauma	Chinmay M. Gupte, Kapil Sugand	Wiley	2018
8	Casebook of Orthopedic Rehabilitation Including Virtual Reality	David Ip	Springer Berlin Heidelber g	2007

Year : 3		
Subject	**Clinical Prosthetic and Orthotic Practice in Neurological Conditions**	
Code	**BPO 306**	
Teaching Hours : 60	**Theory : 60**	**Practical: Practical paper given separate in Subject Code 353**
Total Credits : 02	**Theory : 02**	
Course Description	This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on neurological conditions. The course integrates theoretical principles, practical applications, and	

	clinical experiences to prepare students for working with individuals who have neurological disorders requiring prosthetic or orthotic devices.
Learning objectives	● *Clinical Competence: Demonstrate clinical competence in addressing the needs of individuals with neurological conditions, showcasing the ability to apply theoretical knowledge to practical rehabilitation scenarios.* ● *Effective Assessment: Exhibit proficiency in conducting comprehensive assessments of neurosurgical injuries, enabling accurate diagnosis and formulation of appropriate rehabilitation plans.* ● *Customized Rehabilitation Plans: Develop the expertise to create customized rehabilitation plans, integrating supportive and corrective appliances that cater to the specific requirements of individuals with neurological challenges.* ● *Enhanced ADL Functionality: Achieve the outcome of improved Activities of Daily Living functionality for patients by providing targeted training and adaptive devices.* ● *Neurosurgical Collaboration: Foster collaboration with neurosurgeons by effectively contributing to the pre and postoperative management of patients undergoing neurosurgical procedures, emphasizing prosthetic and orthotic interventions.*
Learning outcomes	● *Patient-Centered Care: Emphasize patient-centered care by considering the unique needs and preferences of individuals with neurological conditions, ensuring a holistic approach to their rehabilitation.* ● *Continuous Improvement: Cultivate a commitment to continuous improvement by staying abreast of advancements in prosthetic and orthotic practices related to neurological conditions, contributing to ongoing professional development.*
Theory (60Hours)	Introduction: - Overview of common neurological conditions requiring prosthetic or orthotic interventions: - Hemiplegia - Cerebral palsy - Tetraplegic Syndrome - Multiple Sclerosis

	- Tabes Dorsalis - Transverse Myelitis - Polio Myelitis - Parkinson's Disease - Motor Neuron Disease - Polyneuritis Ataxia - Extra Pyramidal Lesion Neuroanatomy and Pathophysiology: - Relevant neuroanatomy for prosthetic and orthotic interventions. - Pathophysiology of neurological conditions affecting the musculoskeletal system: - Peripheral Neuropathy - Peripheral Nerve Injuries - Sciatica - Brachial Neuritis and Neuralgia - Facial Palsy and Bell's Palsy - Syringomyelia - Monoplegia - Myopathy and Muscular Dystrophy - Sub-acute Combined Degeneration of Spinal Cord General and Physiotherapeutic Management of Psychiatric Patients: - Overview of management approaches for psychiatric patients in rehabilitation. Neuro-Surgery: - Pre and post-operative prosthetic and orthotic management of neuro-surgical conditions and complications. - Management of peripheral nerve injuries. - Pre and post-operative physiotherapeutic management of nerve repair and grafting. - Rehabilitation following head injury, laminectomy, brain tumor surgery, and craniotomy. Role of Prosthetics & Orthotics in Neurosurgery: - Understanding the mechanism of injury and primary/secondary complications. - Assessment and provision of supportive and corrective appliances for rehabilitation. - Adapted devices tailored to neurological rehabilitation needs. - Training and support in activities of daily living (ADL) for neurologically impaired individuals.

Text Book and Journals

Sl No	Title	Author	Publisher	Year/ Volume
1	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Meeko Mitsuko K. Oishi, Ian M. Mitchell, H. F. Machiel Van der Loos	Springer Science & Business Media,	2010
2	Designing Accessible Technology	P. John Clarkson, P. Langdon, P. Robinson	Springer Science & Business Media,	2006
3	Assistive Technologies for Assessment and Recovery of Neurological Impairments	Stasolla, Fabrizio	IGI Global	2021
4	Assistive Technologies and Other Supports for People With Brain Impairment	Marcia J. Scherer	Springer Publishing Company	2012
5	Handbook of Decision Support Systems for Neurological Disorders	D. Jude Hemanth	Academic Press	2021
6	Handbook of Electronic Assistive Technology	Ladan Najafi, Donna Cowan	Academic Press	2018
7	Assistive Technology for Cognition: A handbook for clinicians and developers	Brian O'Neill, Alex Gillespie	Psychology Press	2014
	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Meeko Mitsuko K. Oishi, Ian M. Mitchell, H.F. Machiel Vander Loos	Springer Science & Business Media	2010
8	Recent Advances in Intelligent Assistive Technologies: Paradigms and Applications	Hariton Costin, Björn Schuller, Adina Magda Florea	Springer Nature	2019
9	Wheel chair selection & configuration	R A Cooper	Demos Medical Publishing	1998
10	Powered Lower Limb Orthotics in Paraplegia	J. Hughes		
11	The Illustrative Guide to Assistive Technology and Devices	Suzanne Robitalle	Demos Medical Pubilishing	2009
12	Orthotics in Neurological Rehabiliation	Aisev, Dereus	Demos Medical Pubilishing	1992

Year 3		
Subject	**Clinical Prosthetics and Orthotics Practice in Pediatric-Practical**	
Code	**BPO 351**	
Teaching Hours : 240	**Theory : Theory paper given separate in Subject Code 304**	**Practical :240**
Total Credits : 08		**Practical : 08**
Course Description	This course is designed to provide students with the knowledge and skills required for clinical practice in the field of prosthetics and orthotics specifically tailored for paediatric patients. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with children who require orthotic or prosthetic devices.	
Learning objective	• *Comprehensive Understanding* • *Diagnostic Proficiency* • *Prescription Competence* • *Paediatric Specialization* • *Wound Care Proficiency* • *Preventive Strategies* • *Interdisciplinary Collaboration* • *Research and Innovation*	
Learning outcomes	• *Students will acquire a comprehensive understanding of orthotic and prosthetic management tailored to pediatric and geriatric populations.* • *Students will develop diagnostic proficiency in assessing a range of musculoskeletal and neurological conditions relevant to orthotic and prosthetic interventions.* • *Students will demonstrate competence in prescribing orthotic and prosthetic devices based on thorough assessments and diagnostic criteria.* • *Students will be specialized in paediatric orthotic and prosthetic care, including assessment, evaluation, and management strategies.* • *Students will acquire proficiency in wound care techniques, particularly in the context of diabetes and paediatric foot care.* • *Graduates will develop preventive strategies for sports-related foot injuries and cardio-pulmonary deconditioning in geriatric patients.* • *Students will understand the importance of interdisciplinary collaboration in providing holistic care to*	

	paediatric and geriatric populations. ● *Students will be encouraged to engage in research activities, promoting innovation in orthotic and prosthetic care for paediatric and geriatric patients.*
Practical (240 Hours)	In pediatric care, various types of prostheses and orthoses are utilized to address the specific needs of children with congenital conditions, developmental disabilities, or acquired injuries. Prostheses for Pediatrics: 1. Upper Limb Prostheses: - Passive prostheses for cosmetic purposes. - Myoelectric prostheses with functional grasping capabilities. - Hybrid prostheses combining passive and active components. - Functional prostheses for specific activities like sports or play. 2. Lower Limb Prostheses: - Below-knee prostheses, including basic and energy-storing designs. - Above-knee prostheses, offering stability and mobility. - Running blades for active children participating in sports. - Waterproof prostheses for swimming and water activities. 3. Partial Foot Prostheses: - Silicone or carbon fiber partial foot prostheses for toe or forefoot amputations. Orthoses for Pediatrics: 1. Upper Limb Orthoses: - Functional hand orthoses for conditions like cerebral palsy or brachial plexus injuries. - Wrist-hand orthoses (WHO) for stabilization and support. - Elbow orthoses for positioning and preventing contractures. 2. Lower Limb Orthoses: - Ankle-foot orthoses (AFO) for foot drop or gait stability. - Knee-ankle-foot orthoses (KAFO) for control of knee and ankle joints. - Hip-knee-ankle-foot orthoses (HKAFO) for children with severe impairments. 3. Spinal Orthoses: - Thoracolumbosacral orthoses (TLSO) for scoliosis or spinal stabilization. - Cervical orthoses (C-collar) for neck support and immobilization. - Lumbosacral orthoses (LSO) for lower back support and

	alignment. 4. Cranial Remolding Orthoses: - Helmets for cranial reshaping in cases of plagiocephaly or brachycephaly. 5. Casting and Bracing Devices: - Serial casting for contracture management in conditions like clubfoot. - Pavlik harness for developmental dysplasia of the hip (DDH) in infants. - ScoliBrace for conservative management of scoliosis. 6. Dynamic Orthoses: - Dynamic ankle-foot orthoses (DAFO) for gait training and correction. - Reciprocating gait orthoses (RGO) for children with paralysis or weakness. 7. Customized Orthoses: - 3D-printed orthoses tailored to individual anatomical needs and functional requirements. These prostheses and orthoses are often custom-designed and fabricated to ensure proper fit, functionality, and comfort for pediatric patients, taking into account their growth and developmental stages. Additionally, they may be modified or replaced as the child grows and their needs change over time.

Text Book and Journals

Sl. No.	Title	Author	Publisher	Year/Vol.
1	Pediatric Rehabilitation Principles and Practices	Michael A. Alexander, Dennis J. Mstthews	demosme dical	5th ed.
2	AAOS atlas of Orthosis and assistive devices,	Hsu, John D.	Mosby publicatio ns/ or N.Y.U. St.Louice, London, Chickago	5th ed.
3	Orthotics and Prosthetics in Rehabilitation	Michelle M. Lusardi PhD PT and Caroline C. Nielsen PhD		3rd ed.
4	Pediatric Rehabilitation Principles and Practices	Kevin P. Murphy,Mary A. McMahon, Amy J. Houtrom	demosme dical	6th ed.
5	Assistive Technology Principles and Practice	Albert M. Cook,Jaan Miller Polgar,Pedro Encarnacao		5th ed.
6.	Short Testbook of Prosthetics & Orthotics	R Chinnathurai		1st ed.
7.	Fundamentals of Amputation Care And Prosthetics	Douglas Murphy		.

Year 3		
Subject	**Clinical Prosthetics and Orthotics Practice in Surgical and Orthopedics Conditions - Practical**	
Code	**BPO 352**	
Teaching Hours : 240	**Theory : Theory paper given separate in Subject Code 305**	**Practical :240**
Total Credits : 08		**Practical : 08**
Course Description	This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on conditions related to surgery and orthopaedics. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with individuals who require prosthetic or orthotic devices due to surgical or orthopaedic conditions.	
Learning objective	● Clinical Competence ● Operative Proficiency ● Complication Management ● Rehabilitation Skills ● Multidisciplinary Collaboration ● Device Application ● Clinical Decision-Making ● Patient Education	
Learning outcomes	● Develop the ability to clinically examine, diagnose, and recommend appropriate non-operative and operative management for a variety of orthopedic conditions. ● Attain proficiency in understanding the principles and indications for operative treatments, including surgical interventions for fractures, dislocations, and amputations. ● Demonstrate knowledge in preventing, identifying, and managing complications associated with fractures, dislocations, and surgical interventions. ● Acquire skills in prosthetic and orthotic management, including the application of devices and techniques for rehabilitation in diverse orthopedic cases. ● Develop an understanding of the collaborative approach between orthopedics, physiotherapy and prosthetics/orthotics for comprehensive patient care. ● Demonstrate the ability to select and apply appropriate orthopedic devices, considering individual patient needs and specific conditions. ● Enhance clinical decision-making skills through the integration	

	of theoretical knowledge with practical application in the management of orthopedic cases. ● Effectively communicate with patients regarding their conditions, treatment options, and the use of orthopedic devices, empowering them in their rehabilitation journey.
Practical (240 Hours)	In surgical and orthopedic conditions, a variety of prostheses and orthoses are utilized to support, stabilize, or aid in the rehabilitation of patients. Prostheses: 1. Upper Limb Prostheses: - Body-powered prostheses: Controlled by body movements such as shoulder shrugs or arm muscle contractions. - Myoelectric prostheses: Controlled by muscle signals detected by electrodes placed on the residual limb. - Passive prostheses: Non-functional, used mainly for cosmetic purposes. 2. Lower Limb Prostheses: - Transtibial (below-knee) prostheses: Designed for individuals with amputations below the knee. - Transfemoral (above-knee) prostheses: Designed for individuals with amputations above the knee. - Syme's prostheses: Ankle disarticulation prostheses that preserve the heel pad. - Knee disarticulation prostheses: Designed for individuals with knee disarticulation amputations. 3. Partial Foot Prostheses: - Silicone prostheses: Designed to restore the appearance and function of partial foot amputations. - Carbon fiber prostheses: Lightweight and durable options for partial foot amputations. 4. Spinal Prostheses: - Spinal implants: Used for stabilization and fusion surgeries, such as pedicle screws, rods, and interbody cages. - Artificial disc replacements: Designed to replace damaged intervertebral discs in the spine. Orthoses: 1. Upper Limb Orthoses: - Wrist splints: Used for immobilization and support of the wrist joint. - Elbow orthoses: Used for immobilization or range of motion control following elbow surgery or injury. - Shoulder orthoses: Designed to provide support and stability to the shoulder joint. 2. Lower Limb Orthoses: - Ankle-foot orthoses (AFO): Used to support the ankle and foot, especially in cases of foot drop or ankle instability.

	- Knee orthoses: Designed for knee stabilization, support, or alignment correction. - Hip-knee-ankle-foot orthoses (HKAFO): Used for individuals with paralysis or severe gait abnormalities. - Patellar stabilizing braces: Used to support and stabilize the patella (kneecap). 3. Spinal Orthoses: - Lumbar orthoses: Used for support and stabilization of the lumbar spine, often in cases of low back pain or following surgery. - Thoracolumbosacral orthoses (TLSO): Used for support and stabilization of the thoracic, lumbar, and sacral spine. - Cervical orthoses: Used for immobilization and support of the cervical spine, especially following neck surgery or injury. 4. Pediatric Orthoses: - Pavlik harness: Used for the treatment of developmental hip dysplasia in infants. - Clubfoot braces (e.g., Ponseti brace): Used for the correction of clubfoot deformity in infants. - Scoliosis braces (e.g., Boston brace): Used for the treatment of scoliosis in children and adolescents. These prostheses and orthoses play crucial roles in restoring mobility, function, and quality of life for individuals with surgical and orthopedic conditions. They are often customized to meet the specific needs of each patient and may require adjustments over time..

Text Books and Journals

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Orthopedics: principles and their application	Terke, Samual L.	Lippencot t, New York	
2.	Global Orthopedics Caring for Musculoskeletal Conditions and Injuries in Austere Settings	David A. Spiegel, Michelle Foltz, Richard A. Gosselin	Springer Internatio nal Publishing	**2019**
3.	Lower-limb Prosthetics and Orthotics Clinical Concepts	Joan E. Edelstein, Ale x Moroz	SLACK	**2011**
4.	Prosthetics and Orthotics	Donald G. Shurr, John W. Michael, Tho mas Michael Cook	Prentice Hall	**2002**
5.	Standard Handbook of Biomedical Engineering and Design	Myer Kutz	McGraw- Hill	**2003**

6.	Evidence-Based Orthopedics	Mohit Bhandari	wiley	2021
7.	ABC of Orthopaedics and Trauma	Chinmay M. Gupte, Kapil Sugand	Wiley	2018
8	Casebook of Orthopedic Rehabilitation Including Virtual Reality	David Ip	Springer Berlin Heidelber g	2007

Year 3		
Subject	**Clinical Prosthetics and Orthotics Practice in Neurological Conditions- Practical**	
Code	**BPO 353**	
Teaching Hours : 240	**Theory : Theory paper given separate in Subject Code 306**	**Practical :240**
Total Credits : 08		**Practical : 08**
Course Description	This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on neurological conditions. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with individuals who have neurological disorders requiring prosthetic or orthotic devices.	
Learning objective	• Clinical Competence • Effective Assessment • Customized Rehabilitation Plans • Enhanced ADL Functionality • Neurosurgical Collaboration • Patient-Centered Care • Continuous Improvement	
Learning outcomes	• Demonstrate clinical competence in addressing the needs of individuals with neurological conditions, showcasing the ability to apply theoretical knowledge to practical rehabilitation scenarios. • Exhibit proficiency in conducting comprehensive assessments of neurosurgical injuries, enabling accurate diagnosis and formulation of appropriate rehabilitation plans. • Develop the expertise to create customized rehabilitation plans, integrating supportive and corrective appliances that cater to the specific requirements of individuals with neurological	

	challenges. ● Achieve the outcome of improved Activities of Daily Living functionality for patients by providing targeted training and adaptive devices. ● Foster collaboration with neurosurgeons by effectively contributing to the pre and postoperative management of patients undergoing neurosurgical procedures, emphasizing prosthetic and orthotic interventions. ● Emphasize patient-centered care by considering the unique needs and preferences of individuals with neurological conditions, ensuring a holistic approach to their rehabilitation. ● Cultivate a commitment to continuous improvement by staying abreast of advancements in prosthetic and orthotic practices related to neurological conditions, contributing to ongoing professional development.
Practical (240 Hours)	In neurological conditions, prostheses and orthoses play an essential role in providing support, stability, and assistance to individuals affected by various neurological impairments. Prostheses: 1. Upper Limb Prostheses: - Body-powered prostheses: Controlled by body movements such as shoulder shrugs or arm muscle contractions. - Myoelectric prostheses: Controlled by muscle signals detected by electrodes placed on the residual limb. - Passive prostheses: Non-functional, used mainly for cosmetic purposes. 2. Lower Limb Prostheses: - Transtibial (below-knee) prostheses: Designed for individuals with amputations below the knee. - Transfemoral (above-knee) prostheses: Designed for individuals with amputations above the knee. - Syme's prostheses: Ankle disarticulation prostheses that preserve the heel pad. - Knee disarticulation prostheses: Designed for individuals with knee disarticulation amputations. 3. Partial Foot Prostheses: - Silicone prostheses: Designed to restore the appearance and function of partial foot amputations. - Carbon fiber prostheses: Lightweight and durable options for partial foot amputations.

	4. Spinal Prostheses: - Spinal implants: Used for stabilization and fusion surgeries, such as pedicle screws, rods, and interbody cages. - Artificial disc replacements: Designed to replace damaged intervertebral discs in the spine. Orthoses: 1. Upper Limb Orthoses: - Wrist-hand orthoses (WHO): Provide support and stabilization to the wrist and hand, often used in conditions like stroke or cerebral palsy. - Elbow orthoses: Used for immobilization or range of motion control following elbow surgery or injury. - Shoulder orthoses: Designed to provide support and stability to the shoulder joint in conditions like shoulder subluxation or brachial plexus injury. 2. Lower Limb Orthoses: - Ankle-foot orthoses (AFO): Used to support the ankle and foot, especially in cases of foot drop or ankle instability seen in conditions like stroke or multiple sclerosis. - Knee orthoses: Designed for knee stabilization, support, or alignment correction in conditions like knee hyperextension or instability. - Hip-knee-ankle-foot orthoses (HKAFO): Used for individuals with paralysis or severe gait abnormalities due to conditions like cerebral palsy or spinal cord injury. 3. Spinal Orthoses: - Lumbar orthoses: Used for support and stabilization of the lumbar spine, often in cases of low back pain or following surgery. - Thoracolumbosacral orthoses (TLSO): Used for support and stabilization of the thoracic, lumbar, and sacral spine in conditions like spinal cord injury or spina bifida. - Cervical orthoses: Used for immobilization and support of the cervical spine, especially following neck surgery or injury. 4. Pediatric Orthoses: - Pavlik harness: Used for the treatment of developmental hip dysplasia in infants. - Dynamic ankle foot orthoses (DAFO): Used to control ankle and foot alignment in children with cerebral palsy or other neurological disorders. - Scoliosis braces: Used for the treatment of scoliosis in children and adolescents with neurological conditions affecting spinal

	alignment. These prostheses and orthoses are tailored to address the specific needs and functional limitations associated with various neurological conditions, thereby enhancing mobility, independence, and overall quality of life for affected individuals.

Text Books and Journals

Sl No	Title	Author	Publisher	Year/ Volume
1	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Meeko Mitsuko K. Oishi, Ian M. Mitchell, H.F. Machiel Vander Loos	Springer Science & Business Media,	2010
2	Designing Accessible Technology	P. John Clarkson, P. Langdon, P. Robinson	Springer Science & Business Media,	2006
3	Assistive Technologies for Assessment and Recovery of Neurological Impairments	Stasolla, Fabrizio	IGI Global	2021
4	Assistive Technologies and Other Supports for People With Brain Impairment	Marcia J. Scherer	Springer Publishing Company	2012
5	Handbook of Decision Support Systems for Neurological Disorders	D. Jude Hemanth	Academic Press	2021
6	Handbook of Electronic Assistive Technology	Ladan Najafi, Donna Cowan	Academic Press	2018
7	Assistive Technology for Cognition: A handbook for clinicians and developers	Brian O'Neill, Alex Gillespie	Psychology Press	2014
8	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Meeko Mitsuko K. Oishi, Ian M. Mitchell, H. F. Machiel Van der Loos	Springer Science & Business Media	2010
9	Recent Advances in Intelligent Assistive Technologies: Paradigms and Applications	Hariton Costin, Björn Schuller, Adina Magda Florea	Springer Nature	2019
10	Wheel chair selection	R A Cooper	Demos Medical	1998

	& configuration		Publishing	
11	Powered Lower Limb Orthotics in Paraplegia	J. Hughes		2009
12	The Illustrative Guide to Assistive Technology and Devices	Suzanne Robitalle	Demos Medical Publishing	1992
13	Orthotics in Neurological Rehabilitation	Aisev, Dereus	Demos Medical Publishing	1992

FOURTHYEAR

Year : 4		
Subject	**Clinical Prosthetic and Orthotic Practice in Spinal pathologies and Disorder**	
Code	**BPO 401**	
Teaching Hours : 60	**Theory : 60**	**Practical: Practical paper given separate in Subject Code 451**
Total Credits : 02	**Theory : 02**	
Course Description	This course is designed for prosthetic and orthotic students, with specialized knowledge and skills related to the management of spinal pathologies and disorders. Participants will explore the application of prosthetic and orthotic interventions in the context of spinal conditions, with a focus on assessment, design, and rehabilitation strategies.	
Learning objectives	● *Understand Spinal Pathologies* ● *Impact of spinal conditions on mobility, function, and quality of life* ● *Analyse the biomechanics of the spine and its role in various spinal pathologies.* ● *Relate biomechanical principles to the design and function of prosthetic and orthotic devices for spinal support.* ● *Evaluate materials and design considerations for spinal orthoses* ● *Apply appropriate clinical assessment techniques for individuals with spinal disorders* ● *Develop treatment plans that incorporate prosthetic and orthotic interventions for spinal conditions.* ● *Modify prosthetic and orthotic interventions to meet the developmental and age- specific needs of patients.* ● *Adhere to legal standards and responsibilities when providing prosthetic and orthotic services for spinal conditions.* ● *Engage in networking and collaboration with professionals in the spinal rehabilitation community.*	
Learning outcomes	● *Students should have a comprehensive understanding of various*	

	spinal pathologies. ● *Students should be able to evaluate the impact of spinal conditions on mobility, function, and quality of life.* ● *Students should be skilled in analyzing the biomechanics of the spine and its role in various spinal pathologies.* ● *Students should be able to relate biomechanical principles to the design and function of prosthetic and orthotic devices for spinal support.* ● *Students should be capable of evaluating materials and design considerations for spinal orthoses.* ● *Students should be proficient in applying appropriate clinical assessment techniques for individuals with spinal disorders.* ● *Students should be able to develop treatment plans that incorporate prosthetic and orthotic interventions for spinal conditions.* ● *Students should be skilled in modifying prosthetic and orthotic interventions to meet the developmental and age-specific needs of patients.* ● *Students should understand and adhere to legal standards and responsibilities when providing prosthetic and orthotic services for spinal conditions.* ● *Students should be able to engage in networking and collaboration with professionals in the spinal rehabilitation community.*
Theory (60Hours)	Introduction to Spinal Pathologies: - Overview of common spinal pathologies such as degenerative disc disease, spinal stenosis, herniated discs, spinal fractures, scoliosis, kyphosis, and spondylolisthesis. - Epidemiology and demographics of spinal conditions, including prevalence rates, age distribution, and risk factors. - Impact of spinal pathologies on mobility, function, and quality of life, including pain, limitations in movement, activities of daily living, and participation in social and recreational activities. Biomechanics of the Spine: - Understanding the biomechanics of the spine, including its structure, function, and movement patterns. - Role of biomechanics in various spinal pathologies, such as degeneration, instability, and deformity. - How abnormal biomechanics can contribute to the development and progression of spinal conditions. Spinal Cord Injuries: - Mechanism of injury in spinal cord injuries (SCI), including traumatic and non-traumatic causes. - Signs and symptoms of SCI, such as paralysis, sensory deficits, and

	loss of bowel and bladder control. - Diagnostic investigations for SCI, including imaging studies and electrodiagnostic tests. - Role of orthotic interventions in the management of SCI, including splinting, bracing, and implantable devices. - Rehabilitation approaches for individuals with SCI, focusing on mobility, function, and independence. Congenital and Acquired Spinal Conditions: - Pathomechanics of congenital spinal anomalies and acquired spinal disorders. - Clinical features and presentation of various congenital and acquired spinal conditions. - Treatment options, including conservative management, manipulation, bracing, splinting, and surgical interventions. - Rehabilitation strategies to optimize function and mobility in individuals with congenital and acquired spinal conditions. Orthosis for Spinal Pain and Deformities: - Pathophysiology of spinal pain and deformities, including osteoarthritis, degenerative disc disease, and spinal deformities. - Treatment recommendations for spinal pain, including the use of orthotic interventions such as lumbar orthoses. - Orthotic management of scoliosis, kyphosis, and other spinal deformities, including biomechanical considerations and treatment options. - Role of orthotic interventions in the prevention of spinal fractures and trauma, as well as postoperative care and management. Orthosis in Spinal Instability: - Biomechanics of spinal instability and its impact on body alignment, balance, and compensation. - Role of orthotic treatment in stabilizing the spine and preventing further injury. - Types of spinal orthoses used for managing instability, including cervical orthoses, cervicothoracic orthoses, and halo orthoses. - Effects of orthotic interventions on body alignment, balance, and overall function in individuals with spinal instability.

Text Books and Journals

Sl. No	Title	Author	Publisher	Year/ volume
1.	Spinal Disorders Fundamentals of Diagnosis and Treatment	Norbert Boos	Springer Berlin Heidelberg	2008
2	Diseases of the Spine and Spinal Cord	Thomas N. Byrne, Stephen G. Waxman, Edward C. Benzel	Oxford University Press, USA	2000
3.	Essentials of Spinal Disorders	Jason C Eck, Christian P DiPaola	Jaypee Brothers Medical Publishers Pvt. Limited	2014
4.	The Management of Spinal deformities	Kenton D .Leatherman Rober A. Dickson	Butter worth Heinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	
5.	Prosthetics & Orthotics LowerLimb& Spine	Seymour, Ron		2002

Year : 4		
Subject	**Clinical Prosthetic and Orthotic Practice in Podiatric, Sports and Diabetic Conditions**	
Code	**BPO 402**	
Teaching Hours :60	**Theory : 60**	**Practical: Practical paper given separate in Subject Code 452**
Total Credits : 02	**Theory : 02**	
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	
Learning objectives	● *Communication* ● *Assessment and prescription;* ● *Clinical provision of prostheses and orthoses;* ● *Designing of prostheses and orthoses;* ● *Interpersonal relationships;* ● *Organisation and management;* ● *Clinical research.* ● *Contributing too and learning from the clinic team.*	
Learning outcomes	**The learning outcomes for the given skills and aspects related to prosthetics and orthotics are:** ● *Students should develop effective communication skills to interact*	

	with patients, healthcare professionals, and other stakeholders. ● *Students should be skilled in conducting thorough assessments and prescribing appropriate prosthetic and orthotic interventions.* ● *Students should be able to provide clinical care involving the fitting, adjustment, and maintenance of prostheses and orthoses.* ● *Students should be capable of designing customized prosthetic and orthotic devices based on individual patient needs.* ● *Students should develop strong interpersonal skills to work effectively within a multidisciplinary team and establish positive relationships with patients.* ● *Students should be able to manage their time and resources effectively, as well as demonstrate organizational skills in a clinical setting.* ● *Students should be able to critically analyze research literature, conduct clinical research, and apply evidence-based practice in their work.* ● *Students should be able to collaborate with the clinic team, contribute to the overall team effort, and continuously learn from their experiences and colleagues.*
Theory (60Hours)	1. Podiatric Assessment, Evaluation, and Diagnostic Tools: - Comprehensive assessment of the foot, including medical history, physical examination, gait analysis, and neurovascular assessment. - Evaluation of foot deformities, such as bunions, hammertoes, and flat feet, using diagnostic tools like X-rays, ultrasound, and MRI scans. - Assessment of neuropathic foot conditions, including diabetic peripheral neuropathy, through sensory testing, nerve conduction studies, and monofilament testing. - Prescription criteria for orthotic devices, shoes, and other foot care products based on the individual's needs, pathology, and functional goals. 2. Diabetes Foot Care Management: - Overview of diabetic foot disease, its prevalence, risk factors, and complications. - Importance of regular foot care, including daily inspection, washing, moisturizing, and proper nail care, for individuals with diabetes. - Wound care management for diabetic foot ulcers, including debridement, offloading, dressings, and topical treatments. - Prevention strategies for diabetic foot complications, such as neuropathy, peripheral arterial disease, and foot ulcers, through education, proper footwear, and regular foot exams. 3. Pediatric Foot Care Management: - Assessment and management of foot conditions in pediatric patients, including congenital anomalies, flat feet, and gait

	abnormalities. - Developmentally appropriate interventions for children with foot problems, including orthotic devices, physical therapy, and footwear modifications. - Prevention strategies for pediatric foot conditions, such as promoting healthy foot development, proper shoe fitting, and early intervention for abnormalities. 4. Sports Foot Injuries Care and Prevention: - Assessment and management of sports-related foot injuries, such as sprains, strains, fractures, and overuse injuries. - Prevention strategies for sports foot injuries, including proper warm-up, stretching, strengthening exercises, and footwear selection. - Integration of prosthetic and orthotic devices in sports medicine for injury prevention, performance enhancement, and rehabilitation of athletes. - Rehabilitation strategies using prosthetics and orthotics for athletes with foot injuries, focusing on restoring function, improving biomechanics, and preventing re-injury. 5. Prosthetics and Orthotics Integration in Sports Medicine: - Application of prosthetic and orthotic devices in sports injury prevention, including custom orthoses for foot and ankle stability, knee support braces, and protective gear for contact sports. - Rehabilitation strategies using prosthetics and orthotics for athletes recovering from sports injuries, focusing on restoring function, improving biomechanics, and preventing re-injury. - Adaptive prostheses for sports and recreation, designed to enhance mobility and performance in athletic activities. - Orthoses for sports and recreation, including custom-made foot orthotics, ankle braces, and knee supports tailored to the specific demands of different sports. 6. POP Cast Management & Advanced Management: - Principles of plaster of Paris (POP) cast application and removal for immobilization of foot and ankle injuries. - Advanced techniques in cast management, including modification, padding, and reinforcement for optimal immobilization and comfort. - Role of orthotic devices, such as walking boots and braces, in the management of foot injuries and post-operative rehabilitation. - Collaboration with other healthcare professionals, such as orthopedic surgeons and physical therapists, for comprehensive management of foot conditions requiring immobilization. 7. Diabetes and its Complications: - Diagnosis and classification of diabetes, including type 1 diabetes,

	type 2 diabetes, and gestational diabetes, based on criteria such as fasting blood glucose, oral glucose tolerance test, and HbA1c levels. - Pharmacotherapy of diabetes, incorporating the latest guidelines from organizations such as the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). - Pathophysiology of diabetic vascular complications, including macrovascular complications such as cardiovascular disease, peripheral arterial disease, and microvascular complications such as diabetic nephropathy, retinopathy, and neuropathy. 8. Introduction to Diabetic Foot Disease and Anatomy and Biomechanics of the Foot: - Overview of the burden of diabetic foot disease, including its prevalence, impact on quality of life, and economic implications. - Clinical aspects related to the anatomy and physiology of the lower limb, including the structure and function of bones, joints, muscles, nerves, and blood vessels in the foot. - Discussion of normal and abnormal biomechanics of the foot, including the role of weight-bearing, gait patterns, and footwear in maintaining foot health and preventing complications such as ulceration and deformity. 9. Diabetic Peripheral Neuropathy: - Discussion of neuropathy in diabetes, including its burden and classification based on nerve fiber involvement and distribution. - Identification of risk factors for peripheral neuropathy in diabetes. - Clinical presentation and evaluation of peripheral neuropathy in diabetes. - Explanation of preventive measures and management strategies for diabetic neuropathy. 10. Peripheral Arterial Disease (PAD): - Overview of the burden of peripheral arterial disease, including its prevalence, impact on mobility and quality of life. - Classification and staging of PAD based on severity. - Identification of risk factors for PAD. - Clinical features of PAD. - Diagnostic testing for PAD. - Management modalities for PAD.

Text Books and Journals

S. No.	Author	Title	Publisher	Year/Vol.
1	AK Agarwal	Essential of Prosthetics & Orthotics (With MCQs & disability Assessment and guideline)	Jaypee	1st ed.
2	Hsu, John D.	AAOS atlas of Orthosis and assistive devices,	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
3	Michelle M. Lusardi PhD PT And Caroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation		3rd ed.
4	Kevin K. Chui ,Milagros Jorge,Sheug – Che Yun,M	Orthotics and Prosthetics in Rehabilitation		4th ed.
5.	Dr. Ankur Jain,Dr. Ankith Mohan	Text Book of Prosthetic Rehabilitation In Paediatrics Dentistry(A Complete Guide of Prosthesis)		
6.	Clifford P. Shearman	Management of Diabetic Foot Complications	Springer London	4 February 2015
7.	Adam Bohr, Kaveh Memarzadeh	Artificial Intelligence in Healthcare	Elsevier Science	21 June 2020
8.	James Chambers	Physical Disability and Rehabilitation Sourcebook, 1st Ed.	Infobase Publishing	2019
9.	Adam Bohr, Kaveh Memarzadeh	Physical Disability and Rehabilitation Sourcebook, 1st Ed.	Elsevier Science	2020
10.	David X. Cifu, Henry L. Lew	Braddom's Rehabilitation Care: A Clinical Handbook E-Book	Elsevier Health Sciences	2017

Journals

- *Journal of Prosthetics and Orthotics, ISSN: 1040-8800*
- *Prosthetics and Orthotics International, ISSN: 0309-3646*
- *National Institute of Health*
- *Standard for Prosthetic & Orthotics*
- *Journals of Rehabilitation R & D, ISSN O742-3241*
- *International Journal of Rehabilitation Research, ISSN: 0342-5282*
- *The Rehabilitation Journal , ISSN: 2521-344x*
- *JHO: Journal of Prosthetics & Orthotics , ISSN: 1040-8800*
- *Canadian Prosthetics & Orthotics Journal, ISSN: 2561-987X*
- *Journal of the American Orthotic and Prosthetic Association*

Year : 4		
Subject	**Digital Technology in Prosthetics and Orthotics**	
Code	**BPO 403**	
Teaching Hours : 60	**Theory : 60**	**Practical: Practical paper given separate in Subject Code 453**
Total Credits : 02	**Theory : 02**	
Course Description	This course explores the integration of digital technology into the field of prosthetics and orthotics. Students will examine the latest advancements in digital tools, techniques, and devices that enhance the design, fabrication, and fitting processes in the creation of prosthetic and orthotic devices. The course will cover a range of topics from digital scanning and modeling to the use of robotics and smart materials, providing a comprehensive understanding of the impact of technology on modern prosthetic and orthotic practices.	
Learning objectives	• *Explain the historical context and evolution of digital technology in the field of prosthetics and orthotics.* • *Demonstrate proficiency in using 3D scanning and imaging technologies for capturing accurate anatomical data.* • *Create, modify, and optimize digital models for customized prosthetic and orthotic devices* • *Interpret and troubleshoot digital scans to ensure quality data acquisition* • *Select appropriate materials and optimize designs for digital fabrication processes.* • *Use VR and AR tools for design visualization and patient interaction in prosthetics and orthotics* • *Analyse digital data to inform personalized device customization.* • *Apply HMI principles for user-friendly device control* • *Design prosthetic and orthotic interfaces that optimize user experience.*	
Learning outcomes	• *Students should have a comprehensive understanding of the historical context and evolution of digital technology in the field of prosthetics and orthotics.* • *Students should demonstrate proficiency in using 3D scanning and imaging technologies for capturing accurate anatomical data.* • *Students should be able to create, modify, and optimize digital models for customized prosthetic and orthotic devices.* • *Students should be skilled in interpreting and troubleshooting digital scans to ensure quality data acquisition.* • *Students should be able to select appropriate materials and*	

	optimize designs for digital fabrication processes. ● *Students should be proficient in using VR and AR tools for design visualization and patient interaction in prosthetics and orthotics.* ● *Students should be capable of analyzing digital data to inform personalized device customization.* ● *Students should understand and apply HMI principles for user-friendly device control.* ● *Students should be skilled in designing prosthetic and orthotic interfaces that optimize user experience.*
Theory (60Hours)	Introduction to Conceptual Design and CAD: - Points, line, and simple objects - Orthographic and isometric projection - Dimension on technical drawing - Methods of dimension and tolerance Introduction to Design Theories: - Developing a concept - Implementing a concept - Creative methods for design Introduction to CAD: - CAD input devices - CAD output devices - CAD Software - Display Visualization Aids - Requirements of Geometric Modeling - Transformations of Geometry - Developing algorithms/computer codes for transformations Computer Graphics: - Introduction to graphics software and packages - Function of graphic package in design and digital communication Introduction to AutoCAD & Fusion 360 updated version, Pro-E, CATIA, and SOLIDWORKS: - Sketcher and other solid modeling packages - Finite element Method - Finite element analysis of solid object - Prosthetic and Orthotic Components Introduction to Assembly Modeling & Approaches: - Top-down and Bottom-up approach - Applying Standard Mates - Applying Advanced Mates - Applying Mechanical Mates

	- Manipulating Components - Creating Pattern - Collision Detection - Physical Dynamics - Industry 4.0 Industry 4.0: - Industry 4.0 environment - The role of Big data and IoT - Introduction to Cyber-Physical system 3D Image Formats: - IGES format, OBJ, STP, STL Format - STL File Problems - STL File Manipulation and Repair Algorithms Digital Design of Customized Devices: - Introduction to 3D scanning - Components of a 3D scanner - Scanning mechanisms - Parameters of choosing a suitable 3D scanner - Cleaning/post-processing of scanned data - File formats - Comparison of conventional cast rectification and 3D post-processing - Post-processing software used in P&O industry - Advantages and disadvantages of 3D scanning Introduction to 3D modeling: - Types of 3D modeling - Basics of hardware and software requirements for 3D modeling - Organic Modeling Software like Mesh mixer, free foam etc. - Tools used in 3D modeling software - Process of 3D modeling - Different file formats and converting to desired extensions - Use of AI & 3D modeling software in P&O industry - Concept of Central Fabrication Unit Additive Manufacturing (AM): - Introduction to 3D Printing - Types of 3D Printer based on Printing Technology - Slicing & printing process - Post-processing of printed Job - Uses of 3D Printers in P&O industry - Comparison between Manual fabrication, Subtractive manufacturing & Addictive Manufacturing in P&O industry Types of AM and its use in P&O:

	- Classification of AM - Material used in AM - Its application in P&O device fabrication - SLP, FFF, DLP, and others

Text Books and Journals

Sl. No.	Title	Author	Publisher	Year/Vol.
1	Digital Sketching Computer-Aided Conceptual Design	John Bacus	Wiley	2020
2	Computer Aided Design and Manufacturing	Zhuming Bi, Xiaoqin Wang	Wiley	2020
3	Computer Integrated Manufacturing & Computer Aided Manufacturing	Dr. Sushil Kumar Choudhary , Dr. R. S Jadoun	Walnut Publication	2021
4	Fundamentals of CNC An Extended Introduction to CNC Machining and Turning Center Usage	Mike Lynch	CreateSpace Independent Publishing Platform	2013
5	Additive Manufacturing Technologies	Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani	Springer International Publishing	2020
6	Machine Tools Design, Research, Application	Jiri Marek, Ľubomír Šooš	IntechOpen	2020
7	Prosthetics and Orthotics	Mokhtar Arazpour	IntechOpen	2021

Journals:

- Journal of Prosthetics Orthotics and Science Technology
- Journal of Prosthetics and Orthotics International
- Journal of Neuro Engineering and Rehabilitation

Year : 4	
Subject	**Employability and Soft skill**
Code	**BPO 405**
Teaching Hours : 60	**Theory : 60**
Total Credits : 02	**Theory : 02**
Course Description	This course is designed to enhance students' employability by focusing on the development of essential soft skills. In today's competitive job market, possessing technical expertise alone is not enough. Employers increasingly seek candidates with strong soft

	skills, such as communication, teamwork, problem-solving, and adaptability. This course aims to equip students with the skills and knowledge necessary to thrive in diverse professional environments.
Learning objectives	● To demonstrate competency in planning and implementing skill training for the disabled people and finding placements in the community. ● To demonstrate the ability to plan skill training activity, organize successful and gainful employment for the disabled people. ● To demonstrate the ability to conduct vocational assessment, identify and find suitable jobs and train the disabled accordingly. ● To know about various employment prospects and it could be of any type such as self-employment, small group employment, small scale business, large scale business, placement in private sectors and public sectors.
Learning outcomes	● Students should demonstrate competency in planning and implementing skill training programs for disabled people. ● Students should be able to plan and organize skill training activities that lead to successful and gainful employment for disabled individuals. ● Students should be proficient in conducting vocational assessments, identifying suitable jobs, and training disabled individuals accordingly. ● Students should have comprehensive knowledge about various employment prospects, including self-employment, small group employment, small-scale and large-scale businesses, private sectors, and public sectors.
Theory (60Hours)	Key issues and principles involved in developing successful and gainful Employment: 1. Implementing pre-vocational skills: - Teaching hygiene, money management, social skills, coordination, and time management through pre-vocational curricula like TALC. - Adapting training programs to individual needs and socio-cultural and economic conditions. 2. Community mapping for employment resources: - Identifying family trades, local businesses, and marketing opportunities. 3. Vocational assessments and programming: - Assessing individual skills and interests to match with suitable trades. 4. Tapping community resources for employment: - Leveraging local resources for training and job opportunities.

	5. Planning and training of persons with disabilities: - Managing self-help groups (SHGs) of adults with disabilities. - Providing vocational training and micro-credit activities for youth with disabilities. - Facilitating placements, marketing linkages, and bank loans for self-employment initiatives. 6. Individual Rehabilitation Plans (IRPs): - Understanding the key principles involved in developing and implementing IRPs. - Documenting the progress and outcomes of IRPs. 7. Involvement of ministries/departments and service providers: - Collaboration with organizations like the National Trust, Ministry of Labour, Ministry of Social Justice and Empowerment, NGOs, and parent organizations. Employment market, types of employment, and avenues: 1. Labour and employment: - Understanding definitions such as underemployment, overemployment, and unemployment. 2. Sectorial categorization of employment: - Recognizing primary, secondary, and tertiary sectors. 3. Types of employment: - Differentiating between open, supported, self, sheltered, and group employment. 4. Apprenticeship ACT and on-the-job training: - Understanding regulations and opportunities for skill development. 5. Entrepreneurship and NHFDC schemes: - Exploring options for entrepreneurship and accessing schemes provided by the National Handicapped Finance and Development Corporation (NHFDC).

Textbooks and Journals

Sl. No.	Title	Author	Publisher	Year/ Vol.
1	Training For Sustainable Development	Bhuban Chandra Mahapatra	Sarup & Sons	2005
2	Job and Work Analysis Guidelines on Identifying Job for Persons with Disabilities	Robert Heron	International Labour office	2005
3	Assisting Disabled Persons in Finding Employment A Practical Guide	Robert Heron, Barbara Murray	International Labour Office	2003
4	Vocational Rehabilitation and Employment of Disabled Persons	International Labour Office, International Labour Office.	International Labour Office	1998
5	Achieving Equal Employment Opportunities for People with Disabilities Through Legislation Guidelines	Committee of Experts on the Application of Conventions and Recommendations International Labour Office	International Labour Office	2004
6	Teaching and Learning Employability Skills in Career and Technical Education Industry, Educator, and Student Perspectives	Will Tyson	Springer International Publishing	2020

Year : 4	
Subject	**Management and Administration**
Code	**BPO 406**
Teaching Hours : 60	**Theory : 60**
Total Credits : 02	**Theory : 02**
Course Description	Students would have an understanding of the planning, construction, human management, store management and safety of the Prosthetics and Orthotics Laboratory
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.*
Learning outcomes	● *Students should understand techniques related to designing, planning, controlling, and improving service and manufacturing operations.* ● *Students should have basic knowledge of financial management practices, including cost calculations and accounting processes.* ● *Students should be able to address issues related to clinic management, such as appointment systems and record keeping.* ● *Students should understand the importance of quality control and workflow management in various operations.* ● *Students should be able to apply appropriate inventory management protocols.* ● *Students should comprehend the benefits associated with the use of quality assurance systems.* ● *Students should understand the organization of the workplace environment and its impact on efficiency and productivity.*
Theory (60Hours)	Introduction to Management and Organization: - Overview of management principles and functions, including planning, organizing, directing, and controlling. - Human Resource Management: Recruitment, training, performance evaluation, and employee relations. - Innovation and Entrepreneurship: Encouraging creativity, risk-taking, and business development. - Leadership: Styles of leadership, communication, and team management. - Motivation: Techniques for motivating employees and enhancing productivity. - Strategic Planning: Long-term goal setting and decision making to achieve organizational objectives. Entrepreneurship & Marketing: - Types of entrepreneurs and their roles in economic growth. - Factors affecting entrepreneurial growth and strategies for mitigating risks. - Opportunity identification, market segmentation, and competitive advantage. - Marketing research, demand-supply analysis, and developing effective business models. - Legal forms of business and considerations for business registration. Total Quality Management:

	- Basic concepts and principles of Total Quality Management (TQM). - Customer focus: Strategies for customer orientation, satisfaction, and retention. - Introduction to ISO standards (ISO 9000 and ISO 14000 series) and their implementation. - Sector-specific standards requirements and benefits of ISO registration. - Documentation requirements and procedures for ISO certification. Material Management: - Purchase management: Centralized, decentralized, and local purchase systems. - Purchasing procedures, supplier selection, and tendering processes. - Store management: Inventory classification, organization, and control. - Use of computer systems for effective inventory management and control. Finance and Accounting: - Cost concepts and classification: Material, labor, overhead, etc. - Cost behavior analysis, preparation of cost sheets, and job order costing. - Cost-volume-profit analysis, budgeting, and budgetary control. - Steps in the recording process: Journal, ledger, trial balance, and financial statements. - Understanding total revenue, total cost, profit, opportunity cost, and production function. Ergonomics and Biomedical Waste Management: - Elements of fire, pollution, and waste management. - Applied anthropometry and workspace design for optimal human performance. - Ergonomic considerations for repetitive tasks, manual handling, and work capacity. - Role of state agencies in biomedical waste management and disposal. Human Rights & Disaster Management: - Human rights of disadvantaged groups: Women, children, displaced persons, and disabled persons.

	- Implementation of human rights through national and state commissions, NGOs, media, and educational institutions. - Management of research and development, innovations, and intellectual property rights (IPR). - Definition, types, causes, impacts, and classification of disasters. - Global trends in disasters and differential impacts based on caste, class, gender, age, location, and disability. Professional Ethics and Conduct: - Appropriate code of ethical behavior for P&O professionals as per RCI and international standards. - Rules of professional conduct and ethical guidelines. Occupational Safety & Health: - Health, safety, and environment guidelines, legislations, and regulations. - Response to emergencies such as power failure, fire, and system failure. - Importance of housekeeping, good shop floor practices, and 5S concept. - Safety attitude development and use of personal protective equipment (PPE). - Basic understanding of hot work, confined space work, and material handling equipment.

Textbooks and Journals

Sl. No.	Title	Author	Publisher	Year/ Vol.
1	Essentials of Project Management	Ramakrishna	. PHI	2010
2	Basic Managerial Skills for All	McGrath E.H.S.J	PHI	2011
3	Strategic Management : The Indian Context	Srinivasan, R	. PHI	2014
4	Materials Management, Procedures, Text and Cases"	Datta A K	PHI	1998
5	Materials Management, Logistics Management, Supply Chain Management , Operations Management,	Prof. L. C. Jhamb	Everest Publishing House	2021

6	Purchasing & Materials Management	Gopalakrishnan	Tata McGraw Hill (TMH) India	2022
7	Financial Management: Theory and Practice	Dr Eugene F Brigham & C Micheal Ehrhardt		
8	Fundamentals of Financial Management:	Brigham Houston		Concise Edition
9	The Richest Man in Babylon	George Samuel Clason		
10	The Total Money Makeover: A Proven Plan for Financial Fitness	Dave Ramsey		
11	The Basics of Public Budgeting & Financial Management	Charles E Menifield		

Year : 4	
Subject	**Clinical Prosthetics and Orthotics Practice in Spinal pathologies and Disorder - Practical**
Code	**BPO 451**
Teaching Hours : 210	**Theory : 210**
Total Credits : 07	**Theory : 07**
Course Description	This course is designed for prosthetic and orthotic students, with specialized knowledge and skills related to the management of spinal pathologies and disorders. Participants will explore the application of prosthetic and orthotic interventions in the context of spinal conditions, with a focus on assessment, design, and rehabilitation strategies.
Learning objectives	● **Understand Spinal Pathologies** ● Impact of spinal conditions on mobility, function, and quality of life ● Analyze the biomechanics of the spine and its role in various spinal pathologies. ● Relate biomechanical principles to the design and function of prosthetic and orthotic devices for spinal support. ● Evaluate materials and design considerations for spinal orthoses ● Apply appropriate clinical assessment techniques for individuals with spinal disorders ● Develop treatment plans that incorporate prosthetic and orthotic interventions for spinal conditions. ● Modify prosthetic and orthotic interventions to meet the developmental and age- specific needs of patients. ● Adhere to legal standards and responsibilities when providing prosthetic and orthotic services for spinal conditions. ● Engage in networking and collaboration with professionals in

	the spinal rehabilitation community.
Learning outcomes	● The learning outcomes for the given objectives related to spinal pathologies, prosthetics, orthotics, and rehabilitation are: ● Students should gain a comprehensive understanding of various spinal pathologies. ● Students should be able to analyze how spinal conditions affect mobility, function, and quality of life. ● Students should have a deep understanding of the biomechanics of the spine and its role in different spinal pathologies. ● Students should be able to relate biomechanical principles to the design and function of prosthetic and orthotic devices for spinal support. ● Students should evaluate materials and design considerations for spinal orthoses. ● Students should be proficient in applying appropriate clinical assessment techniques for individuals with spinal disorders. ● Students should develop treatment plans that incorporate prosthetic and orthotic interventions for spinal conditions. ● Students should be able to modify prosthetic and orthotic interventions to meet the developmental and age-specific needs of patients. ● Students should adhere to legal standards and responsibilities when providing prosthetic and orthotic services for spinal conditions. ● Students should learn to engage in networking and collaboration with professionals in the spinal rehabilitation community.
Theory (210Hours)	Assessment, Design, Fitment, and Delivery of Spinal Orthosis for Different Spinal Conditions: 1. Spinal Deformity: - Assessment: Comprehensive evaluation of spinal alignment, curvature, range of motion, and neurological status. - Design: Customized orthosis design based on the type and severity of deformity, such as scoliosis or kyphosis. - Fitment: Precise fitting of the orthosis to support the spine in the corrected position while allowing for functional movement. - Delivery: Patient education on wearing schedule, care instructions, and follow-up appointments for adjustments. 2. Spinal Arthritis: - Assessment: Evaluation of joint inflammation, pain, stiffness, and functional limitations. - Design: Orthosis design focused on providing stability, reducing pain, and improving alignment to alleviate arthritic symptoms. - Fitment: Proper fitting to support affected joints, distribute

	pressure, and facilitate optimal movement patterns. - Delivery: Education on wearing schedule, usage guidelines, and strategies for managing arthritis symptoms. 3. Inflammatory Spinal Conditions: - Assessment: Identification of inflammatory markers, pain intensity, mobility restrictions, and disease activity. - Design: Orthosis design aimed at reducing inflammation, stabilizing affected areas, and promoting healing. - Fitment: Customized fitting to accommodate inflammation-related changes in spinal alignment and mobility. - Delivery: Patient education on wearing schedule, monitoring for flare-ups, and adjustments as needed. 4. Degenerative Spine Conditions: - Assessment: Assessment of degenerative changes, disc herniation, spinal stenosis, and associated symptoms. - Design: Orthosis design tailored to provide support, alleviate pressure on degenerated structures, and maintain spinal alignment. - Fitment: Proper fitting to address specific degenerative issues while allowing for functional movement and comfort. - Delivery: Guidance on wearing schedule, activity modification, and exercises to manage degenerative spine conditions. 5. Spinal Fractures: - Assessment: Evaluation of fracture type, stability, neurological involvement, and associated soft tissue injuries. - Design: Orthosis design focused on immobilization, stabilization, and protection of the fractured spine. - Fitment: Precise fitting to ensure proper alignment and support while allowing for healing and rehabilitation. - Delivery: Education on wearing schedule, precautions to prevent further injury, and rehabilitation exercises. 6. Spinal Pain Conditions: - Assessment: Assessment of pain characteristics, triggers, aggravating factors, and impact on daily activities. - Design: Orthosis design aimed at reducing pain, providing support, and improving posture to alleviate symptoms. - Fitment: Customized fitting to address specific pain locations and promote comfort during activities. - Delivery: Education on wearing schedule, pain management strategies, and techniques for improving spinal health and function.

Year : 4	
Subject	**Clinical Prosthetics and Orthotics Practice in Podiatric, Sports and Diabetic Conditions - Practical**
Code	**BPO 452**
Teaching Hours : 240	**Theory : 240**
Total Credits : 08	**Theory : 08**
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.
Learning objectives	● Communication ● Assessment and prescription. ● Clinical provision of prostheses and orthoses. ● Designing of prostheses and orthoses. ● Interpersonal relationships. ● Organization and management. ● Clinical research. ● Contributing too and learning from the clinic team.
Learning outcomes	● Students should develop effective communication skills to interact with patients, colleagues, and other healthcare professionals. ● Students should be able to perform thorough assessments and prescribe appropriate prosthetic and orthotic interventions. ● Students should be proficient in providing clinical care for patients requiring prostheses and orthoses. ● Students should learn the skills and techniques involved in designing custom prosthetic and orthotic devices. ● Students should understand the importance of building and maintaining positive interpersonal relationships within the clinical setting. ● Students should acquire knowledge and skills related to organization and management in a clinical setting. ● Students should be able to understand and apply clinical research findings to improve patient care and outcomes. ● Students should develop the ability to collaborate with the clinic team, contribute to a positive work environment, and continuously learn from their colleagues.
Theory (210Hours)	Assessment, Fabrication, Fitment, and Delivery of Orthoses for Different Foot Pathologies: 1. Assessment: - Detailed examination of the foot, including medical history,

	biomechanical evaluation, gait analysis, and assessment of range of motion. - Identification of specific foot pathologies such as plantar fasciitis, flat feet, high arches, bunions, hammertoes, and neuromuscular conditions. 2. Fabrication: - Customized fabrication of orthoses based on the individual's foot anatomy, pathology, and functional needs. - Selection of appropriate materials such as foam, plastic, carbon fiber, or soft padding to provide optimal support and cushioning. 3. Fitment: - Precise fitting of the orthoses to ensure proper alignment, support, and comfort. - Adjustments may be made during the fitting process to accommodate any changes in foot structure or gait pattern. 4. Delivery: - Patient education on wearing schedule, care instructions, and gradual adaptation to wearing orthoses. - Follow-up appointments may be scheduled to monitor progress, make adjustments, and address any concerns. Assessment, Fabrication, Fitment, and Delivery of Orthoses for Diabetic Foot Conditions and Neuropathic Feet: 1. Assessment: - Comprehensive evaluation of foot sensation, circulation, skin integrity, and risk factors for diabetic foot complications. - Identification of neuropathic symptoms such as numbness, tingling, burning sensations, and loss of protective sensation. 2. Fabrication: - Custom fabrication of orthoses with extra-depth, cushioning, and pressure-relieving features to reduce the risk of foot ulcers and injuries. - Consideration of offloading techniques to alleviate pressure on high-risk areas such as the plantar surface of the foot and toes. 3. Fitment: - Careful fitting of orthoses to ensure optimal offloading and protection while maintaining proper foot alignment and function. - Modifications may be made to accommodate any deformities, foot abnormalities, or areas of increased pressure. 4. Delivery:

	- Patient education on the importance of daily foot inspection, proper footwear, and adherence to a foot care regimen. - Instruction on the correct use of orthoses, including wearing schedule, cleaning, and maintenance. - Regular follow-up appointments for ongoing foot evaluation, orthotic adjustments, and education reinforcement.

Year : 4		
Subject	**Digital Technology in Prosthetics and Orthotics - Practical**	
Code	**BPO 453**	
Teaching Hours : 210	**Theory : Theory paper given in subject code 403**	**Practical : 210**
Total Credits : 07		**Practical : 07**
Course Description	This course explores the integration of digital technology into the field of prosthetics and orthotics. Students will examine the latest advancements in digital tools, techniques, and devices that enhance the design, fabrication, and fitting processes in the creation of prosthetic and orthotic devices. The course will cover a range of topics from digital scanning and modeling to the use of robotics and smart materials, providing a comprehensive understanding of the impact of technology on modern prosthetic and orthotic practices.	
Learning objectives	● Explain the historical context and evolution of digital technology in the field of prosthetics and orthotics. ● Demonstrate proficiency in using 3D scanning and imaging technologies for capturing accurate anatomical data. ● Create, modify, and optimize digital models for customized prosthetic and orthotic devices ● Interpret and troubleshoot digital scans to ensure quality data acquisition ● Select appropriate materials and optimize designs for digital fabrication processes. ● Use VR and AR tools for design visualization and patient interaction in prosthetics and orthotics ● Analyse digital data to inform personalized device customization. ● Apply HMI principles for user-friendly device control ● Design prosthetic and orthotic interfaces that optimize user experience.	
Learning outcomes	● Students should have a thorough understanding of the historical context and evolution of digital technology in the field of prosthetics and orthotics. ● Students should demonstrate proficiency in using 3D scanning and imaging technologies for capturing accurate anatomical	

	data. ● Students should be able to create, modify, and optimize digital models for customized prosthetic and orthotic devices. ● Students should learn to interpret and troubleshoot digital scans to ensure quality data acquisition. ● Students should be able to select appropriate materials and optimize designs for digital fabrication processes. ● Students should use VR and AR tools for design visualization and patient interaction in prosthetics and orthotics. ● Students should analyze digital data to inform personalized device customization. ● Students should apply HMI principles for user-friendly device control. ● Students should design prosthetic and orthotic interfaces that optimize user experience.
Theory (210Hours)	● 3D scanning and printing technology have revolutionized the field of prosthetics and orthotics by offering innovative solutions for designing, modifying, and manufacturing custom devices. ● 3D Scanning: - Utilizes specialized scanners to capture detailed three-dimensional images of anatomical structures. - Scans the patient's residual limb or affected body part to create a digital representation of its shape and dimensions. - Provides precise measurements and accurate depiction of surface contours, allowing for customization of prosthetic and orthotic devices. - Offers a non-invasive and efficient method for capturing patient-specific data, reducing the need for traditional plaster casting techniques. ● Computer-Aided Design (CAD): - CAD software is employed to manipulate and optimize digital models created from 3D scans. - Designers and clinicians can modify the digital models to customize prosthetic and orthotic components according to individual patient requirements. - Allows for the creation of complex shapes, adjustments to fit, and optimization of functionality based on biomechanical principles. - Enables rapid prototyping and iteration, facilitating faster design iterations and patient feedback. ● 3D Printing: - Utilizes additive manufacturing technology to produce

	physical prototypes or final prosthetic and orthotic components directly from digital models. - 3D printers deposit successive layers of material (such as plastics, resins, or metals) based on the CAD design, building up the desired shape. - Offers flexibility in material selection, allowing for the use of biocompatible and lightweight materials suitable for prosthetic and orthotic applications. - Enables the creation of intricate geometries and complex internal structures that may not be achievable through traditional manufacturing methods. ● CAD/CAM Integration: - Integrates CAD models with Computer-Aided Manufacturing (CAM) systems to facilitate precise manufacturing processes. - CAM software generates toolpaths and instructions for CNC machines or 3D printers based on the digital design data. - Ensures accuracy and consistency in the fabrication of prosthetic and orthotic devices, minimizing errors and optimizing production efficiency. ● Overall, the integration of 3D scanning, CAD design, and 3D printing technologies offers significant advantages in the design and manufacture of prosthetic and orthotic devices, enabling customization, precision, and rapid prototyping to meet the unique needs of individual patients.

Year : 4	
Subject	**PROJECT WORK**
Code	**BPO 454**
Teaching Hours : 240 (Practicals)	**Practical : 240**
Total Credits : 08	**Practical : 08**
Course Description	Each Trainee shall take a project work under supervision of a guide. Project work has to be well documented and presented in essay form or as per guidelines of respective university. 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 date of admission/promotion to the fourth year.
The process of undertaking a project work as part of a training program is crucial for the overall development of a trainee. 1. Selecting a Subject and Guide:	

- Identify an area of interest or specialization within the field of prosthetics and orthotics.
- Research potential topics and consult with faculty members, supervisors, or industry experts to determine the feasibility and relevance of the chosen subject.
- Choose a knowledgeable and experienced guide or mentor who can provide guidance and support throughout the project.

2. Defining the Scope and Objectives:
- Clearly define the scope and objectives of the project, including the specific research questions or problems to be addressed.
- Establish clear goals and milestones to guide the progress of the project and ensure timely completion.

3. Literature Review:
- Conduct a comprehensive review of existing literature and research studies related to the chosen subject.
- Identify gaps in current knowledge or areas requiring further investigation.
- Synthesize relevant findings to inform the design and methodology of the project.

4. Formulating a Research Plan:
- Develop a detailed research plan outlining the methodology, data collection methods, and analytical techniques to be employed.
- Determine the sample size, population characteristics, and any ethical considerations or regulatory requirements that need to be addressed.
- Plan the timeline and budget for the project, allocating resources effectively to achieve the desired outcomes.

5. Data Collection and Analysis:
- Collect data according to the research plan, using appropriate tools and techniques.
- Analyze the data using statistical software or qualitative analysis methods, depending on the nature of the research.
- Interpret the results and draw conclusions based on the findings, addressing the research objectives and hypotheses.

6. Documentation and Presentation:
- Document the entire process of the project, including the research methodology, data collection procedures, analysis techniques, and results.
- Prepare a comprehensive report or essay summarizing the key findings, conclusions, and implications of the project.
- Present the project work to the guide, faculty members, and peers through seminars, presentations, or written submissions, adhering to the guidelines provided by the university or training program.

7. Revision and Finalization:
- Incorporate feedback received from the guide and reviewers to revise and refine the project work.
- Ensure that the final documentation meets the standards and requirements set by the

university or training program.

- Submit the completed project work within the stipulated timeframe, following any formatting or submission guidelines specified.

By following these steps and engaging in a systematic approach to project work, trainees can demonstrate their knowledge, skills, and ability to conduct independent research in the field of prosthetics and orthotics.

INTERNSHIP PROGRAMME

Internship is compulsory for the Bachelor's of Prosthetics and Orthotics programme.

1. **Duration: 6 months**

2. **Eligibility**: Internship will commence immediately after the declaration of results of the final year/semester, and the candidate is declared pass in all four years/eight semesters.

3. **Structure and duration of postings:** The placements of students for internship will be determined by the respective institute conducting the course. Students must spend a minimum of 50% of the internship period at the parent institute. Exposure should encompass areas where limited exposure was provided at the parent institute.

4. **Mode of supervision during internship:** Supervision must be provided by a Prosthetics and Orthotics Professional with valid registration from the Rehabilitation Council of India.

5. **Maintenance of records by students:** Each student is required to maintain records of the number of hours spent in clinical work across different areas and institutions. This record should be certified by the head of the department/organization/institution or their nominee where the student is undergoing internship.

6. **Extension of internship:** Internship duration shall be extended by the number of days the student remains absent.

7. **Stipend:** Stipend will be provided as per the norms of the parent Institute/university.

8. **Grading and evaluation of students:** Grading and evaluation will be conducted by the institute where the candidate is undergoing internship. Students may be required to repeat postings in which their performance is found unsatisfactory.

9. **Certification:** The parent institute/affiliating University will award a certificate upon successful completion of the internship, following an exit exam and/or viva voce.

10. **Degree certificate:** The University shall award the degree certificate only upon successful completion of the internship.