

**Kerala University of Health Sciences
Thrissur**



SYLLABUS

For

**Bachelors of Prosthetics and Orthotics
Four Years Duration (Annual) + 6 months Internship**

Course Code: 028

2024-25 Admission onwards

Bachelor of Prosthetics and Orthotics (B.P.O.) Programme

I. PREAMBLE

Prosthetics and Orthotics is a specialized health care profession, which combines a unique blend of clinical and technological skills. The Prosthetic and Orthotic Professionals assess and evaluate patients, prescribe custom design, fabricate, and fit the orthoses and prostheses. Rehabilitation of persons with locomotor disabilities or neuromuscular disorder is a team work, where Centre of attention are the persons with disabilities. This work requires substantial clinical and technical judgment. Prosthetic and Orthotic Professional does not only provide service to persons with neuro- musculoskeletal disorder and persons with disability, but also it provides service to general health and work related disorder such as foot disorders, fracture, sports injuries, disorders due to aging, tendinitis, muscular pain , aesthetic restoration etc.. Prosthetics and Orthotics Professionals play an important role in the comprehensive pre and post-surgical management of amputee and other neuro musculoskeletal disorders. Prosthetics and Orthotics Professionals makes the patient independent, confident and useful member of the society through comprehensive prosthetic and orthotic management

II. OBJECTIVES

At the end of the BPO Course, the learner shall be able:

1. To assess, prescribe and provide comprehensive prosthetic and orthotic management to the individual and the community appropriate to his/her position as a member of the health care team.
 2. Be competent to take preventive, supportive, corrective and rehabilitative steps in respect to the commonly encountered problems related to prosthetics and orthotics.
 3. To carry out Evidence Based Practice in prosthetics and orthotics
 4. Appreciate the psycho-social, cultural, economic, and environmental factors affecting health, and develop humane attitude towards the patients/relatives, in discharging one's professional responsibilities
 5. Be familiar with the various National policies and acts related to empowerment of Persons with Disabilities.
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6. Acquire basic management & administrative skills in the areas of materials, financial and human resources related to prosthetics and orthotics
7. Develop the communication skills to establish effective communication with the stake holders
8. Practice prosthetics & orthotics ethics in patient care, service delivery, and research.
9. Develop attitude for self-learning and acquire necessary skills including the use of appropriate technologies.

III. NOMENCLATURE

BACHELOR OF PROSTHETICS & ORTHOTICS (B.P.O.)

IV. PROGRAMME STRUCTURE

FIRST YEAR

Course Code	Title	Theory Hrs	Practical Hrs	Total Hrs	Marks Theory	Marks Practical	Total Marks	Credit Points
BPO101	Anatomy	120	40	160	100	--	100	
BPO102	Physiology	90	30	120	100	--	100	
BPO103	Workshop Technology & Material Science	80	20	100	100	--	100	
BPO104	Applied Mechanics & Strength of Materials	80	20	100	100	---	100	
BPO105	Biomechanics I	60		60	100	--	100	
BPO106	Basic Electronics	60	-	60	100		100	
BPO107 / 151	*Prosthetic Science –I	80	230	310	100	100	200	
BPO108 / 152	*Orthotic Science - I	80	230	310	100	100	200	
	Total	<u>650</u>	570	1220	800	200	1000	

SECOND YEAR

Course Code	Subjects	Theory Hrs	Practical Hrs	Total Hrs	Marks Theory	Marks Practical	Total Marks	Credit Points
BPO201	Pathology	80		80	100	--	100	
BPO202	Orthopaedics, Amputation Surgery & Imaging Science	80	20	100	100	--	100	
BPO203	Community Rehabilitation & Disability Prevention	60		60	100		100	
BPO204	Biomechanics II	70	30	100	100		100	
BPO 205	Psychology & Sociology	60		60	100		100	
BPO206 / 251	*Prosthetic Science-II	80	300	380	100	100	200	
BPO207 / 252	*Orthotic Science-II	80	300	380	100	100	200	
BPO 208	Pharmacology	60		60	100		100	
	Total	570	650	1220	800	200	1000	

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THIRD YEAR

Course Code	Subjects	Theory Hrs	Practical Hrs	Total Hrs	Marks Theory	Marks Practical	Total Marks	Credit Points
BPO301/353	Computer Science & graphical communication	80	120	200	100	100	200	
BPO302	Bio-Mechanics-III	80		80	100	--	100	
BPO303	Assistive Technology	80		80	100	-	100	
BPO304	Research Methodology & Bio Statistics	60	---	60	100	---	100	
BPO305/351	*Prosthetic Science-III	80	320	400	100	100	200	
BPO306/352	*Orthotic Science-III	80	320	400	100	100	200	
	Total	460	760	1220	600	300	900	

FOURTH YEAR

Course Code	Subjects	Theory Hrs	Practical Hrs	Total Hrs	Marks Theory	Marks Practical	Total Marks	Credit Points
BPO401/451	*Prosthetics Science-IV	60	160	220	100	100	200	
BPO402/452	*Orthotic Science-IV	80	160	240	100	100	200	
BPO403	Management & Administration	80	--	80	100	--	100	
BPO453	*Prosthetics Clinical Practice	--	250	250	-	200	200	
BPO454	*Orthotics Clinical Practice	---	250	250	-	200	200	
BPO455	Project Work**	--	180	180	---	100	100	
	Total	220	1000	1220	300	700	1000	

**Joint projects may also be undertaken.

Note:- *All theory & Practical examinations in the discipline of Prosthetics and Orthotics shall be conducted only by the regular appointed Prosthetic and Orthotic Faculty / Teachers from a teaching institution.

IV.1 Content of each subject in each year

FIRST YEAR

TITLE --- ANATOMY
COURSE CODE--- BPO101
TEACHING HOURS---- 160 (Theory-120, Practical-40)
CREDITS --- As per affiliated university norms

Course Description:

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

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

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

DETAILED CONTENTS

Histology: General Histology, study of the basic tissues of the body;

Microscope, Cell, Epithelium, Connective Tissue, Cartilage, Bone, Muscular tissue, Nerve

Embryology:

Development of bones, axial and appendicular skeleton and muscles

Regional anatomy

Thorax:

a) 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

b) 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.

c) 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.

d) Musculo Skeletal 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

Upper Extremity:

a) Osteology: Clavicles, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges.

b) Soft parts: pectoral region, axilla, cubital fossa, palm, dorsum of hand, muscles, nerves, blood vessels.

c) Joints: Shoulder girdle, shoulder joint, elbow joints, radio ulnar joint, wrist joint and joints of the hand.

d). Arches of hand, skin of the palm and dorsum of hand.

Lower Extremity:

a) Osteology: Hip bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.

b) 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.

c) Joints: Hip Joint, Knee joint, Ankle joint, joints of the foot.

Trunk & Pelvis:

a) Osteology: Cervical, thoracic, lumbar, sacral and coccygeal vertebrae and ribs

b) Soft tissue: Pre and Para vertebral muscles, intercostals muscles, anterior abdominal wall muscles, Inter-vertebral disc.

c) Pelvic girdle and muscles of the pelvic floor

Head and Neck: Osteology: Mandible and bones of the skull

Applied Anatomy: Surface anatomy, locomotion and movements. Anthropometry.

Anatomy Practical:

Demonstration of various tissues and cells and Dissection - Demonstration of Lower limbs, upper limbs, spine, surface anatomy and marking.

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RECOMMENDED BOOKS & JOURNALS

ANATOMY

Sl.No.	Author	Title	Publisher	Year/Vol.
1.	Chaurasia, B D	Human Anatomy: Regional and Applied	CBS, New Delhi	2004 3V
2.	Chaurasia, B D	Human Osteology	CBS, New Delhi	1991
3.	Field, Derek	Anatomy: Palpation and Surface Markings	Butterworth, London	1997
4.	A.K.Dutta	Human Osteology		
5.	John V. Basmajian	Grant's Method of Anatomy		
6.	Richard L. Drake, Wayne Vogl& Adam W.M. Mitchell	Gray's Anatomy for Students		

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TITLE ---PHYSIOLOGY
COURSE CODE--- BPO102
TEACHING HOURS---- 120 (Theory-90, Practical-30)
CREDITS --- As per affiliated university norms

Course Description:

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

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

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

DETAILED CONTENTS

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. Bloodindices, 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: Dyspnoea. Orthopnoea. Hyperpnoea, hyperventilation, apnoea, tachypnoea :define
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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 for dysfunction.
- Micturition – Physiological anatomy and nervous connection of the bladder, cystometrogrammicturition 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:

1. Clinical examination of nervous system.
2. Clinical examination of sensory system.
3. To study the phenomenon of fatigue in human by Dynamometer

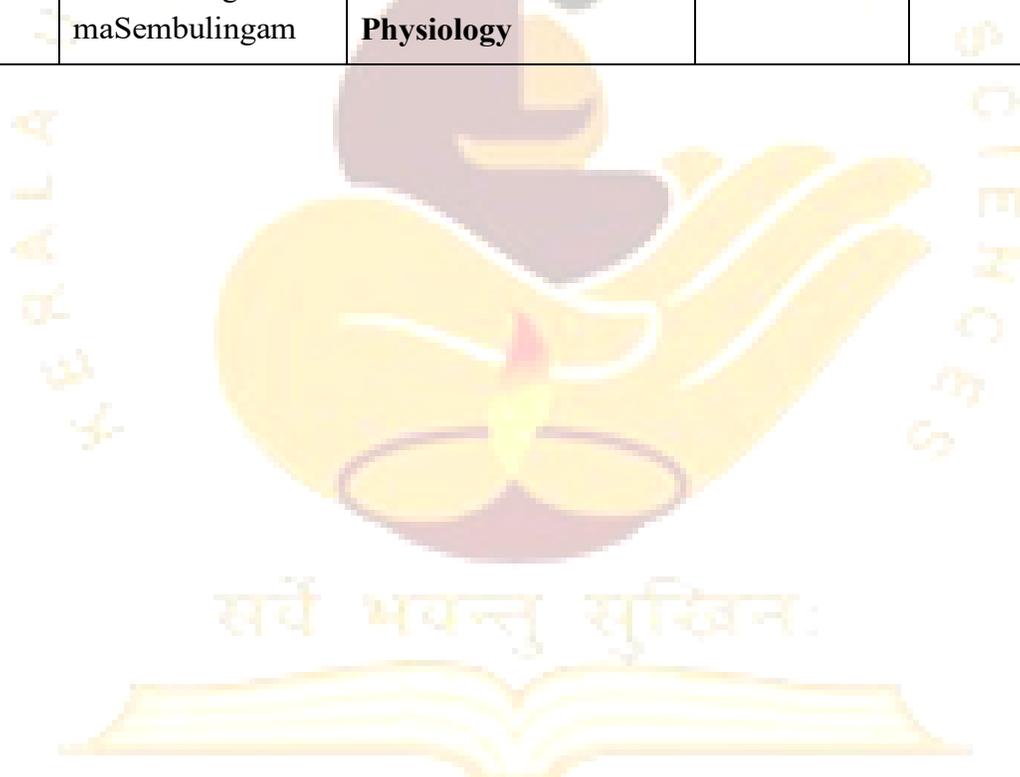
Note: for above practical – physiology practical manual for B.Sc. [Hons.], OT, PT, B.Sc. Nursing and allied sciences Edition first reprint 2006 by CBS publishers

Author: Raj Kapoor

RECOMMENDED BOOKS & JOURNALS

PHYSIOLOGY

Sl. No.	Author	Title	Publisher	Year/Vol.
1	Chatterjee, C. C.	Human Physiology	Medical Allied	1997 2V
2.	Dr. A. K. Jain	Human Physiology for B.D.S and PT/OT Students		1 st Edition 1998
3.	Guyton, A.C. and Hall, J. E.	Text Book of Medical Physiology	W.B.Saunders, Singapore	1998
4.	K.Sembulingam&Pre maSembulingam	Essentials of Medical Physiology		



TITLE--- WORKSHOP TECHNOLOGY& MATERIAL SCIENCE
COURSE CODE--- BPO103
TEACHING HOURS120
CREDITS --- As per affiliated university norms

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

- Be familiar with the occupational health and safety policy and procedures in the workplace.
- 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 behaviour 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.

DETAILED CONTENTS

General: Introduction to bench work, hand tools, measuring tools and instruments. Equipment for mass production, introduction to lathe machine and its operation, milling machine and its operations, tooling, attachment, Shaping machine and its uses. Grinding machine, Drilling Machine Abrasive machine etc. Special tools and equipment used in fabrication of orthoses and prostheses. Compressors, Vacuum Pumps and Dust Collection Equipment's, Cutting Tools (Chisels, Saws and Metal Cutters), Pneumatic Tools Power Cutting tools

Workshop Safety & Hazards and Care

Mechanical working of metals such as steel and aluminium.

Fundamental of riveting, soldering, brazing and welding.

Workshop Technology Practical Practice: Practical work on workshop practices. Practical training on lathes, Drilling Machine (Bench and Pedestal), Grinding

Machine, Router, hotair oven, sanding machine, heat gun, pneumatic machines and other machines. Practical work on various materials and tools and its use in prosthetics & Orthotics.

MATERIAL SCIENCE

Metal & Alloys: Fundamentals of metals and alloys both ferrous and nonferrous. Properties, testing and inspection of metals and alloys, heat treatment of metals. Powder metallurgy, surface coating of metals.

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

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

Fabric: Fabric types, properties, utilization, selection and quality control. **Polymers & composite materials:** Introduction to Plastics, type of plastics and molecular structures. Relationship of properties to structures. Monomers, Polymers, additives, Mechanical properties, effect on properties of method of production.

Fabrication processes, Effects of fabrication, process, micro structural changes, shrinkage and other degradation during processing, environmental effects. Thermoforming plastics, their fabrication process, thermosetting plastics and fabrication process Composite materials and their uses-Resin: 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.

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

RECOMMENDED BOOKS & JOURNALS

WORKSHOP TECHNOLOGY & MATERIAL

SCIENCE

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Calin, Andrea	Material science & engineering		6th ed.
2.	Biller, Jose	Physics of plastics		
3.	Bulson, P.S.ed	Carbon materials for advanced technologies		
4.	Ram, Arie	Fundamentals of polymer engineering		
5.	Chan, Karence K. ed.	Plastics technology handbook		2nd ed.
6.	Nigel Mills	Polymer Foams Handbook		
7.	O.P.Khanna	Text book of Material Science & metallurgy		
8.	S.W.Tasi	Introduction to Composite materials		
9.	L.J.Broutman&R.H. Kroch	Composite Materials		
10.	M.K.Murlidhar	Material Science & Process		
11.	B.S. Raghuvanshi	Workshop Technology Vol. I & II	Dhanpat Rai & Co. Delhi	
12.	John Lord& Ann Reed	Basics Mechanics Explained	Butter North, Oxford	
13.	Chapman	Workshop Technology		Vol. I, II & III

TITLE- Applied Mechanics & Strength of Materials
COURSE CODE--- BPO104
TEACHING HOURS --100
CREDITS --- As per affiliated university norms

Course Description:

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

- Demonstrate an ability to utilize appropriate terminology and units to describe mechanical principles.
- Derive free body diagrams in order to describe clinical problems and generate treatment solutions.
- Apply the mechanical principles of statics and dynamics to quantify and explain linear and angular motion of the human body
- Apply the concepts of stress and strain in the analysis of basic structural elements.
- Determine and draw diagrams for internal forces and bending moments (axial forces, shear forces, moments and torques) in a structural member.
- Explain the principles of composition and resolution of forces and use these principles to solve clinical problems
- Discuss the concepts of work energy and power
- Explain the principles of fluid mechanics and describe how the principles can be applied in clinical situations.
- Explain mechanisms underlying failure of structures under deformation.

DETAILED CONTENTS

General Mechanics: Definition of Mechanics, Foundation material on Units, dimensional homogeneity, scalar and vector quantities, Co-ordinate systems, Newton's laws. Resolution and summation of forces and moments in two and three Dimensions, equivalent force systems, free body diagrams, equations of Equilibrium, plans and space frame analysis. Parallel and non- parallel Forces, torque. Linear and angular motion, uniform acceleration, friction, inertia, moment of inertia, dynamic equilibrium (translation/rotation), Energy, momentum.

Simple stress & Strain: Definition of stress and strains, factor of safety stress, modulus of elasticity, longitudinal strain and internal strains. Poisson's ratio etc. stress and strain curve, statement of formulae relating between different modules, simple problems to understand the above principles of composite bars-formula relating to loads and strains

in individual members simple to understand the above relations.

General: Practices on parallel and non-parallel forces, torque. Linear and angular motion, uniform acceleration, friction, inertia.

Design concept: Buckling, theories in failure, fatigue and stress concentrations, connections, 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 and beam deflection.

Control systems: Introduction to control theory and its applications in Prosthetics and Orthotics.

Ecogonomics with applied mechanics

General: definition and scope in modern industrial social studies on Machinery man oriented topics. Displays devices for transmitting information from machine to man. Controls in information from man to machine. Safety factors, Pollution, noise, fumes, atmospheric pollution if motion study in relation to Ergonomics principles.

RECOMMENDED BOOKS & JOURNALS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	R.S.Khurmi	Applied Mechanics		
2.	JagdishLal	Strength of Materials		

TITLE - BIO-MECHANICS- I
COURSE CODE--- BPO 105
TEACHING HOURS --80
CREDITS --- As per affiliated university norms

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.

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

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

DETAILED CONTENTS

Basic Concepts in Biomechanics: Kinematics and Kinetics:

Types of Motion, Location of Motion, Direction of Motion, Magnitude of Motion, Definition of Forces, Force of Gravity Reaction forces, Equilibrium, Objects in Motion, Force of friction, Concurrent force systems, Parallel force systems, Work, Moment arm of force, Force components Equilibrium of levers.

Joint structure and Function: Joint design, Materials used in human joints, General properties of connective tissues, Human joint design, Joint function, Joint motion

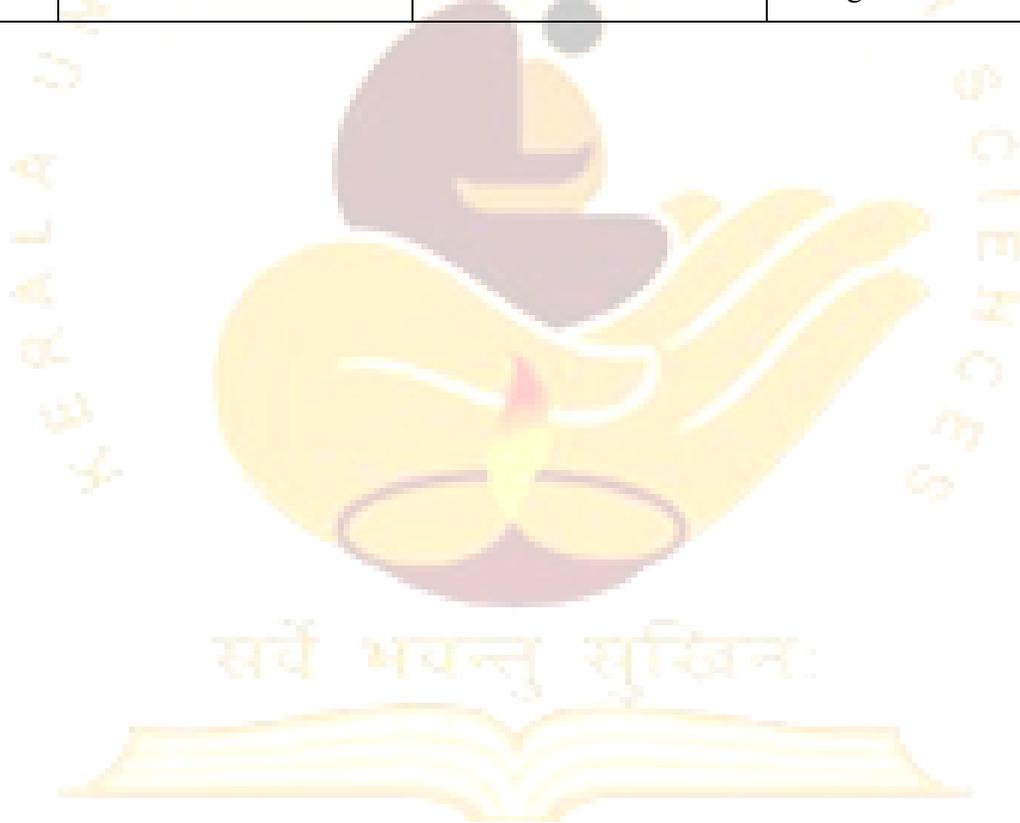
Introduction to Normal Human locomotion, Biomechanics of Ankle & Foot,
 .Biomechanics of Foot & ankle foot Orthosis. Biomechanics of Symes prosthesis,
 partial foot prosthesis, below knee (trans tibial) prosthesis.

RECOMMENDED BOOKS & JOURNALS

BIOMECHANICS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	P. Bowker, D.N. Conde, D.L. Bader, D.J.PRATT	Bio-mechanical basis of Orthotics Management	Butter worth- Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP	
2.	Humphrey, Jay D.	Introductionto biomechanics		
3.	Hamill, Joseph	Biomechanical Basis of humanmovement		2 nd ed.
4.	Rose, Jessicaed.	Human walking		
5.	Soderberg, L.ed.	Kinesiology		
6.	Hoffoman shirt J. ed.	Introduction of Kinesiology		2 nd ed.
7.	Tyldesley, Barbara	Muscles, nerves &movement		3 rd ed.
8.	Perry, Jacuelin	Gait analysis		
9.	Tozeren, Aydin	Humanbody dynamics		
10.	Harries, G.F.ed	Humanmotion analysis		
11.	Dvir, Zeevi	Clinical biomechanics		
12.	Hall Susan J	Basic Biomechanics	McGraw-Hill	

13.	Hausdorff, Alexander Jeffrey M, Neil B	Gait disorders	B. I. Publications P	
14.	Duane Knudson	Fundamentals of Bio- Mechanics		2nd ed.
15.	StanleyBell P Frank	Principles of mechanics and biomechanics	B. I. Publications uk	
16.	Black Jonathan	Clinical Biomechanics		
17.	Donatelli, R.A.	Biomechanics of the Foot and Ankle	Davis, Philadelphia	
18.	Kapandgi, I.A.	Physiology of Joints	Churchill- Livingstone	Vol. I, II & III



TITLE- BASIC ELECTRONICS
COURSE CODE--- BPO 106
TEACHING HOURS --80
CREDITS --- As per affiliated university norms

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

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

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

DETAILED CONTENTS

Electricity: Basic Concepts: Introduction to SI System of units, charge, current, resistance, potential differences, electromotive force, Energy power, Voltage and current Relationship, energy storage, DC circuits, AC circuits, sine wave, Frequency, Period, phase, RMS value, inductive and capacitive reactance.

Resistors: Resistors sensitive to temperature, strain and light, Resistors in series and in parallel.

Transformers: Principle of the transformer, voltage, turns and current ratios. **Semi-Conductors:** Outline Concepts of semiconductors and insulators. Conduction in intrinsic and extrinsic semiconductors.

Amplifiers: Amplifiers as a system element. Operational amplifiers and their ideal characteristics. The small single equivalent circuit having a controlled source. Voltage and current gain, the decibel power gain, Noise and drift voltages, Source in amplifiers

and bio-systems.

Feed Back: The general Feedback equation, Feedback Voltage series, negative feedback and loop gain, loop gain Accuracy, input resistance, output resistance, band width of noise. Feedback as a control mechanism in the wider sense, Positive feedback – instability and self-oscillation in amplifiers and oscillators.

Measurements: Electronics measuring instruments. Summary of recording instruments. Concepts of resolution and accuracy applied to digital and analogue instruments. Transducers for temperature, light, pressure, sounds, description, specification and use in circuit.

Myoelectrodes: Technology of metal and metal paste electrodes, the equivalent circuit between electrodes, stability, source of unwanted voltage electrode systems. Other types of myoelectrodes micro electrodes, implanted electrodes, comparison with surface electrodes. Sensors, microprocessors etc.

Electrical Safety: Description of single phase and three phase supply system and voltage involved. Function of line, neutral and earth in single phase system. Current practice in pin connection and colour codes. Simple safety procedure to be taken when servicing equipment. Effect on safety of fault conditions. Fuses, Conductors and earth leakage detectors – miniature circuit breakers (MCB). Voltage regulators integrated circuits.

Bio-Electricity: Biological Potentials, Muscle action potentials, Electro-myography and Myo-electricity

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RECOMMENDED BOOKS & JOURNALS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	Thereja, B.L.	Basic electronics		
2.	C.D.	Sensor technologyhandbook		
3.	Singh, Anokh	Fundamentals of digital electronics & microprocessors		
4.	Ralph. W. Stach, Ph.D.	Biological & Medical Electronics	London.	
5.	by E.E. Svek / Ling D.E.E.	Bio-electricity		



TITLE- PROSTHETICS SCIENCE-I
COURSE CODE--- BPO107
TEACHING HOURS---- 80 (Theory-80)
CREDITS --- As per affiliated university norms

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

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

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

DETAILED CONTENTS

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

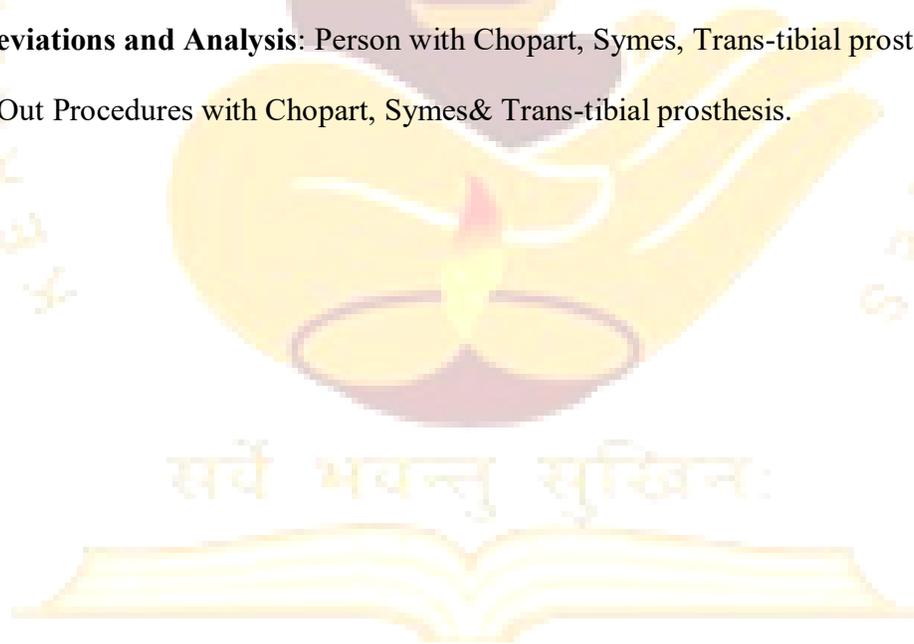
Partial Foot Prostheses: Various types of Partial foot prosthesis. Biomechanics of Partial foot prosthesis, Prescription Principles, Materials used for partial foot prostheses, various casting & fabrication techniques of Partial foot prosthesis.

Syme's: 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 TSBetc, Different types of suspension. Alignment techniques

Gait Deviations and Analysis: Person with Chopart, Symes, Trans-tibial prosthesis.

Check-Out Procedures with Chopart, Symes & Trans-tibial prosthesis.



TITLE--- ORTHOTICS SCIENCE-I
COURSE CODE--- BPO108
TEACHING HOURS --80
CREDITS --- As per affiliated university norms

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

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

- Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
- Recognize and describe the signs and symptoms of the most common pathologies which require Orthotic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
- Demonstrate empathy between Orthotic theory and the environment in which the 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.

DETAILED CONTENTS

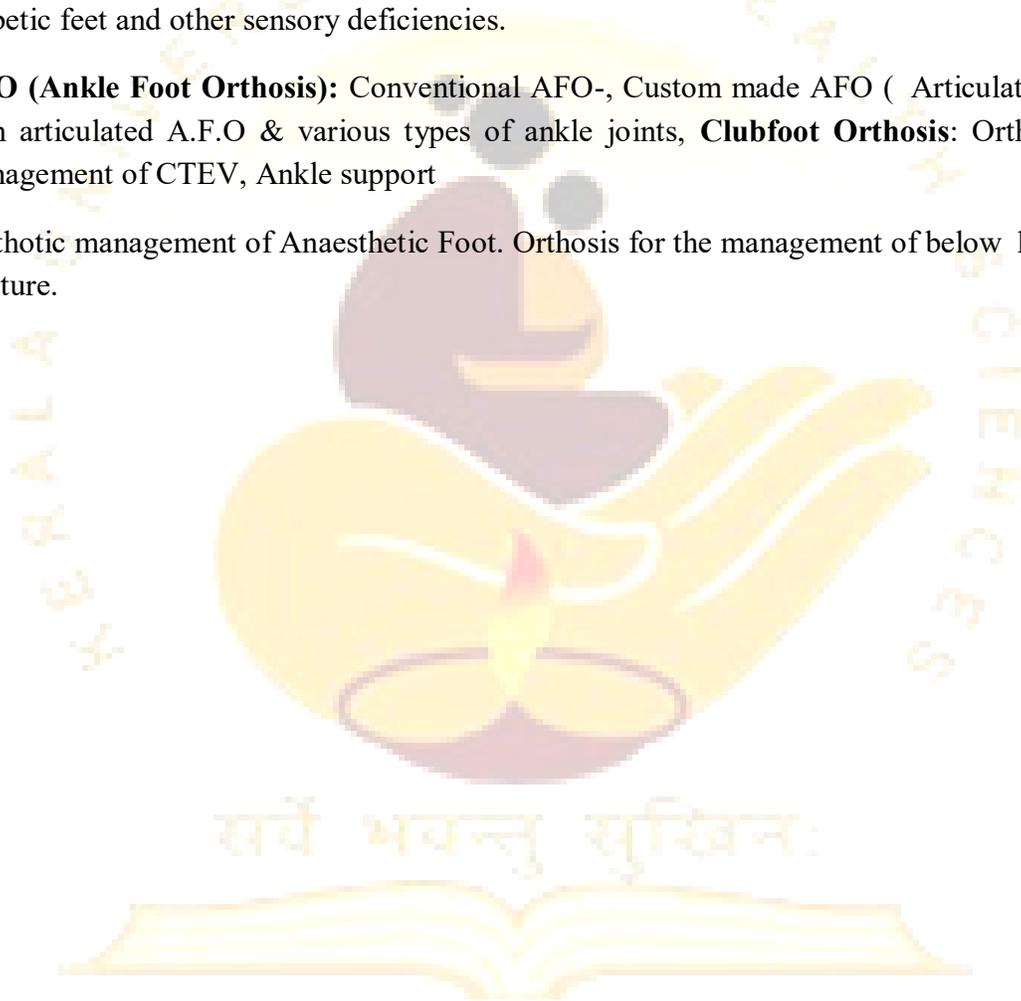
General: Introduction to Orthotics, definitions of various terminologies, History of Orthoses in India and abroad. Various materials used in Orthotics. Foot & Ankle Deformities.

Different types of Orthoses: Users/Client's assessment and prescription criteria, Measuring and casting, cast modification, three point force system, fabrication, fitting, aligning, checking out and finishing of the following devices:

Pedorthics: Medial/Lateral raise (Inside /outside shoe), M.T. Bar (Inside / Outside shoe), Arch support, Meta tarsal pad, 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. Various types of Foot Orthoses for diabetic feet and other sensory deficiencies.

AFO (Ankle Foot Orthosis): Conventional AFO-, Custom made AFO (Articulated & Non articulated A.F.O & various types of ankle joints, **Clubfoot Orthosis:** Orthotic management of CTEV, Ankle support

Orthotic management of Anaesthetic Foot. Orthosis for the management of below knee fracture.



RECOMMENDED BOOKS & JOURNALS

S. No.	Author	Title	Publisher	Year/Vol.
1.	Shurr. G. Donald&J.W.Michel	Prosthetics & Orthotics		
2.	Seymour, Ron	Prosthetics & Orthotics LowerLimb& Spine		
3.	May Bella J.	Amputations & Prosthetics	Jaypee Publisher New Delhi	
4.	Nowoczenski, Deborah A.	Orthotics in functional rehabilitation of the lowerlimb		
5.	American Academy of Orthopaedic Surgeons	Atlasfor prosthetic rehabilitation, Surgeryandlimb deficiency.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	
6.	Edestein, Joan E.	Orthotics	Jaypee Publisher New Delhi	
7.	Hsu, John D.	AAOS atlas of Orthosis and assistive devices,	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	
8.	Kent, Wu	FOOT ORTHOSIS		
9.	D.N. Condieand S. Turner	An Atlas of Lower Limb Orthotic Practice		
10	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation		
11.	Deborah A. Nawocze	Orthotics inFunctionalRehabilitation of the LowerLimb		
12.	P.Bowker, D.N. CondeD.L.Bader, D.J.PRATT	Bio-mechanical basis of Orthotics Management	Butter worth- Heinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	
13	Michel M. Lusardi	Orthotic & Prosthetic management		

TITLE--- PRACTICAL PROSTHETICS SCIENCE-I
COURSE CODE--- BPO 151
TEACHING HOURS --310
CREDITS --- As per affiliated university norms

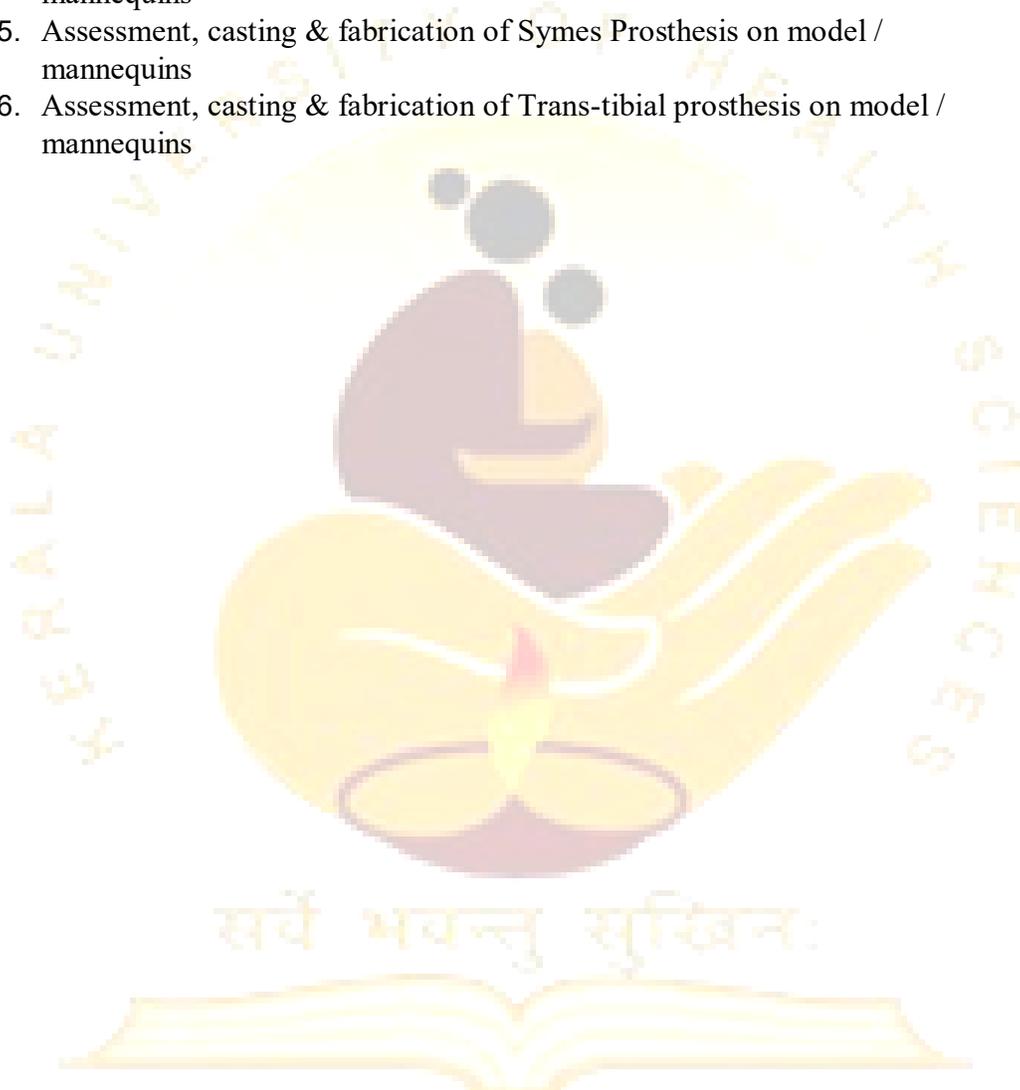
Course Description: This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

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

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

Prosthetics Practical: _

1. Taking case history of a minimum of 10 individuals / Patients
2. Fabrication of Prosthetic Feet,
3. Assessment, casting & fabrication of Partial foot prosthesis on model / mannequins
4. Assessment, casting & fabrication of Chopart Prosthesis on model / mannequins
5. Assessment, casting & fabrication of Symes Prosthesis on model / mannequins
6. Assessment, casting & fabrication of Trans-tibial prosthesis on model / mannequins



TITLE --- PRACTICAL ORTHOTICS SCIENCE-I
COURSE CODE--- BPO 152
TEACHING HOURS --310
CREDITS --- As per affiliated university norms

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

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

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

Practical:

1. Taking case history of a minimum of 10 individuals / Patients

2. Assessment, Evaluation & fabrication of Different types of foot Orthoses on model / mannequins
3. Assessment & Evaluation of Shoe modifications
4. Assessment, casting & fabrication of all types of Mechanical Ankle Joint, conventional & Custom moulded (A.F.O.) on model / mannequins
5. Assessment, casting & fabrication of functional fracture Orthosis for below knee on model / mannequins



SECOND YEAR

TITLE --- PATHOLOGY
COURSE CODE--- BPO201
TEACHING HOURS --80
CREDITS --- As per affiliated university norms

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.

The student should be able to meet the following 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).

DETAILED CONTENTS

a. 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, Repair, Wound healing by primary and secondary union, factors promoting and delaying the process.

b. Hemodynamic disorders, thrombo embolic disease & shock. Ischemic, necrosis, thrombosis, embolism, Infarction, shock. Gangrene. Thromboangitis obliterans.

Neoplasia – Definition, classification, Biological behaviour : Benign and Malignant, Carcinoma and Sarcoma, principles of their spread.

c. Hypersensitivity diseases and immunity – Brief overview of hypersensitivity reaction allergies & auto immune diseases.

d. Genetic disorders – Brief over view of genetic disease.

e. 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.

- f. Metabolic disorders – Diabetic mellitus- Types, Pathogenesis, Pathology, Laboratory diagnosis
- g. Disorders of blood. Constituents of blood and bone marrow, Regulation of hematopoiesis. Anemia: Classification, clinical features & lab diagnosis.

RECOMMENDED BOOKS & JOURNALS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	By Robins	Basics of Pathology		
2.	By Dr. Harsh Mohan	Test Book of Pathology	Jaypee Publisher New Delhi	



TITLE ---ORTHOPAEDICS, AMPUTATION SURGERY AND IMAGING
COURSE CODE--- BPO202
TEACHING HOURS --100
CREDITS --- As per affiliated university norms

Course Description: In this unit the students learn 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.

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

- Have an understanding of 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 post operative care of the stump and stump hygiene
- Describe the stump dermatology and the common skin diseases and management.
- Describe and fabricate the post operative fitting in the lower extremity.
- Describe common surgical technique and how they may influence prosthetics and Orthotics fit and design
-

DETAILED CONTENTS

Orthopaedics : General: 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, eg - Inflammation of Joints, Rheumatoid Arthritis, infective arthritis, tuberculosis arthritis, Osteoarthritis, Ankylosing spondylitis, arthritis of hemophilic joints, Neuropathic joints. Inflammation of tendon sheath and bursa,

Disease 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, plantarfasciitis, Anesthetic feet, Bunion toe Hallux Valgus)

Shoulder: Outline of Recurrent dislocation, Bicipital tendinitis and periarthrits.

Elbow and forearm: Outline of Cubitusvarus 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 Disease, AVN (Full) Peripheral Nerve Injuries, Congenital anomalies Muscular Dystrophy etc.

Sports injuries and their management.

Amputation Surgery

General: Indications/ causes, General Principles, Types of amputation, i.e., Guillotine,

Flap, Osteoplastic Myoplastic, Osteo-myoplastic. Individual's Preparation for prosthesis. Ideal stump. Preoperative, operative and postoperative prosthetic management techniques in general.

Amputation: 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

Demonstration of different conditions & relevant x-ray films, how to read x-ray, how to measure the deformity x-ray, Cobbs & Rib angle measurement etc. Assessment related to P&O management.

RECOMMENDED BOOKS & 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, Samuel L.	Orthopedics: principles and their application	Lippencott, New York	
5.	Miroslow Vitali	Amputation & Prosthesis		

TITLE- Community Rehabilitation & Disability Prevention
COURSE CODE--- BPO203
TEACHING HOURS --60
CREDITS --- As per affiliated university norms

Course Description: The course is designed to assist the students to develop understanding of the health and socio-economic context of people with disabilities in the community.

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

- recognise members of the clinic team and identify benefits associated with a team approach
- Describe and discuss theoretical principles of Physiotherapy & Occupational Therapy
- Describe theories related to the psychology of loss and disability;
- Discuss the social causes of disability in India and the link between poverty and disability.
- Reflect and analyze on their attitude/values and attitudes towards persons with disabilities, their families and the community (Socio-cultural and religious)
- Explain the UN convention rights and role as Prosthetist and Orthotist

DETAILED CONTENTS

Normal Posture: definition & description, static and dynamic, alignments of various joints, centre of gravity, planes & muscular moments, and Analysis of posture

Movements: Anatomical definition and description, Movements and exercise as therapeutic modality and their effects, Physiological reaction of exercise.

Traction: Rational, Technique, indications & contra indications.

Therapeutic Techniques: Electrotherapy, Heat therapy, Hydrotherapy, Exercise Therapy

Muscle Testing: Concept, introduction, significance and limitations. Grade systems, techniques of muscle testing, goniometry.

Child development in brief - milestone and delayed milestone, Assessment procedure, Evaluation of muscle power, range of motion, checking of joint stability

Functional Assessment including Activities of Daily Living (ADL), stretching, pre prosthetic management, Exercise through games involving parents or guardians, Stump bandaging application etc.

Introduction to impairment, disability and handicap and International Classification of Functioning, Disability and Health (ICF). Introduction to disability issues, Government schemes and initiatives, legislation and UNCRPD,

Specific disorders and management: Peripheral nerve injuries. Poliomyelitis, Cerebral Palsy, Muscular Dystrophy, Club foot (CTEV), Spina Bifida, Hemiplegia, Spinal Cord injuries (paraplegia/ Quadriplegia),

- General re-actions of motor unit
- Disease of peripheral nerves – inflammatory neuropathies, immune mediated infections, polyneuropathies [leprosy, etc, hereditary neuropathies, acquired metabolic & toxic neuropathies, nutritional neuropathies, Traumatic neuropathies.
- Disease of skeletal muscle.
- Muscular dystrophies, Myotonic dystrophy

Concept of comprehensive Rehabilitation, Rehabilitation team and role of each member of the team.

Introduction to Physical Medicine, Principles of clinical examinations, diagnosis and treatment. Different aspects of physical medicine and rehabilitation.

Rehabilitation aspects of other disabilities including visual, speech & hearing and mental retardation and disability evaluation.

Rehabilitation of Geriatric population: problems related with ageing and their management.

Introduction to Health care System- Rehabilitation in Health care, rehabilitation under various ministries, introduction to Institute based rehabilitation (IBR) and Community Based Rehabilitation (CBR). Prosthetics & Orthotics in CBR and Role of CBR Workers in P&O.

Community Based Rehabilitation: CBR and its need – difference between IBR and CBR, Simple knowledge about other disabilities, its prevention and its management, Role of P&O Professionals in CBR, Role of other professionals in CBR, Early identification and early Intervention, How to work as a team in CBR/IBR structure, Simple techniques to make CBR activities more purposeful, Telemedicine

RECOMMENDED BOOKS & JOURNALS

PHYSIOTHERAPY/OCCUPATIONAL THERAPY

Sl. No.	Author	Title	Publisher	Year/Vol.
1	1 Park, J.E.	Text Book of Preventive and Social Medicine	Banarsidas, Jabalpur	1987
2.	Pedretti, L.W.	Occupational Therapy: Practice skill	Harcourt-Brace, New York	1990
3.	Win & Parry	Hand Splinting		
4.	Brunn Stones	Movement Therapy in hemiplegia		
5.	Pagliarulo, M.A.	Introduction to Physical Therapy	Mosby, London	
6.	Jones,	Human Movement Explained	Butterworth Heine	
7.	Gardiner, Dena	Principles of Exercise Therapy	CBS, New Delhi	
8.	Froster, A. and Palastanga, N.	Clayton's Electrotherapy: Theory and Practice	AITBS, Delhi	
9.	Jhon, Low and A Reed	Electrotherapy Explained	Butterworth Heine Oxford	
10.	Hislop, H.J. and Montgomery, J.	Daniels and Worthingham's Muscle Testing: Techniques of Manual Examination	W.B.Saunders Philadelphia	2002
11.	Tidy's Physiotherapy	Thomson, A	Varghese, Mumbai	
12.	Kendal, F.P.	Muscles Testing and Function	Lippi cott, New York	1993

TITLE--- BIO-MECHANICS-II
COURSE CODE--- BPO 204
TEACHING HOURS --100
CREDITS --- As per affiliated university norms

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.

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

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

DETAILED CONTENTS

Tissue Mechanics: Study of mechanical characteristics and function of Bones, skin, ligaments, cartilage and muscles.

Biomechanics of Hip , biomechanics of Knee

Posture & Gait: Normal gait: general features of gait, gait initiation, kinematics and kinetics of gait, energy requirements, Pathological gait Introduction to EMG studies and recording EMG

Joint Force Analysis: Body segment parameters, joint forces during swing and stance phase, force analysis of foot and ankle joint, knee joint and Hip joint.

Human locomotion and Gait analysis: Introduction to different ways to do gait analysis by using force plate/TV analysis/ electromyography studies, energy studies, gait repeatability, variation due to age, variation due to footwear, Orthoses/Prostheses. Trans Femoral Amputee, gait analysis and deviations, gait variations due to alignment or pathological conditions.

Through knee Biomechanics: Through knee Prescription Principles, socket biomechanics and alignment techniques.

Trans Femoral Prosthetics Biomechanics: General Socket biomechanics, Trans Femoral socket biomechanics and analysis of socket forces. Analysis of Trans Femoral Prosthetic components.

Gait deviation: Gait deviation while using while using Foot Orthoses (FO), Ankle Foot Orthoses (AFO) and trans-tibial prostheses.

Above knee Orthotics Biomechanics: Biomechanical principals of various kinds of above knee Orthosis especially Knee Ankle Foot Orthosis and Floor Reaction Orthosis. Biomechanics of HKAFO especially to prevent scissoring. Three/ four/five point force system. KAFO and HKAFO gait deviations due to alignments or pathological conditions. Gait analysis of KAFOs and HKAFOs with various types of crutches.

RECOMMENDED BOOKS & JOURNALS

BIOMECHANICS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	P. Bowker, D.N. Conde, D.L. Bader, D.J.PRATT	Bio-mechanical basis of Orthotics Management	Butter worth- Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP	
2.	Humphrey, Jay D.	Introduction to biomechanics		
3.	Hamill, Joseph	Biomechanical Basis of human movement		2 nd ed.
4.	Rose, Jessicaed	Human walking		
5.	Soderberg, L.ed	Kinesiology		

6.	Hoffoman shirt J. ed.	Introduction of Kinesiology		2 nd ed.
7.	Tyldesley, Barbara	Muscles, nerves & movement		3 rd ed.
8.	Perry, Jacuelin	Gait analysis		
9.	Tozeren, Aydin	Humanbody dynamics		
10.	Harries, G.F.ed	Human motion analysis		
11.	Dvir, Zeevi	Clinical biomechanics		
12.	HallSusan J	Basic Biomechanics	McGraw-Hill	
13.	Hausdorff, Alexander Jeffrey M, Neil B	Gait disorders	B. I. Publications P	
14.	Duane Knudson	Fundamentals of Bio-Mechanics		2nd ed.
15.	StanleyBell P Frank	Principles of mechanics and biomechanics	B. I. Publications uk	
16.	Black Jonathan	Clinical Biomechanics		
17.	Donatelli, R.A.	Biomechanics of the Foot and Ankle	Davis, Philadelphia	
18.	Kapandgi, I.A.	Physiology of Joints	Churchill-Livingstone	Vol. I, II & III

TITLE --- PHARMACOLOGY
COURSE CODE--- BPO208
TEACHING HOURS--- 60
CREDITS --- As per affiliated university norms

1. General Pharmacology:

- Introduction, Definitions, Classification of drugs, Sources of drugs, Routes of drug administration, Distribution of drugs, Metabolism and Excretion of drugs, Pharmacokinetics, Pharmacodynamics, Factors modifying drug response, Elementary knowledge of drug toxicity, drug allergy, drug resistance, drug potency, efficacy & drug antagonism.

2. Autonomic Nervous system

Cholinergic and Anti-Cholinergic drugs, Adrenergic and Adrenergic blocking drugs, Peripheral muscle relaxants.

3. Neuropharmacology (in brief) :Sedative-Hypnotic Drugs: Barbiturates, Benzodiazepines, Antianxiety Drugs: Benzodiazepines, Other Anxiolytics, Drugs Used in Treatment of Mood Disorders: Monoamine Oxidase Inhibitors, Tricyclic Antidepressants, Atypical Antidepressants, Lithium, Antipsychotic drugs

4. Disorders of Movement (in brief) :Drugs used in Treatment of Parkinson's Disease, Antiepileptic Drugs, Spasticity and Skeletal Muscle Relaxants

5. Inflammatory/Immune Diseases-Non-narcotic Analgesics and Nonsteroidal Anti-Inflammatory Drugs, Acetaminophen, NSAIDs, Aspirin, Nonaspirin NSAIDs, drug Interactions with NSAIDs, Glucocorticoids: Pharmacological Uses of Glucocorticoids, adverse effects,

Physiologic Use of Glucocorticoids, 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 Erythematosis, Scleroderma, Demyelinating Disease,

6. Respiratory Pharmacology (in brief) : Obstructive Airway Diseases, Drugs used in Treatment of Obstructive airway Diseases, Allergic Rhinitis

7. Digestion and Metabolism (in brief): Gastrointestinal Pharmacology: Peptic Ulcer Disease, Constipation, Diarrhea, Drugs Used in Treatment of Diabetes Mellitus: Insulin, Oral Hypoglycemics

8. Geriatrics: Pharmacology and the geriatric Population: Adverse effects of special concern in the Elderly, Dementia, Postural hypotension, urinary incontinence.

TITLE---- PSYCHOLOGY AND SOCIOLOGY
COURSE CODE--- BPO 205
TEACHING HOURS--- 60
CREDITS --- As per affiliated university norms

Course Description: The course is designed to assist the students to develop understanding of the health and socio-economic context of people with disabilities in the community and their role and the role of CBR and introduce different members of the clinic team and theoretical principles of rehabilitation.

The student should be able to meet the following learning objectives

- Recognise members of the clinic team and identify benefits associated with a team approach
- Describe and discuss theoretical principles of rehabilitation;
- Reflect and analyse on their attitude/values and attitudes towards persons with disabilities, their families and the community (Socio-cultural and religious)
- Explain the different approaches to rehabilitation.
- Explain different component of CBR and the guiding principles of CBR implementation.
- Explain P & O role in a CBR programme

A. Psychology & Social work:

Introduction to Psychology, Outline of Psychology and behavior, Intelligence and abilities, Learning and Remembering, Psychological Development, Cognitive Processes, Personality, Moral Development, Psychological aspect of disability. The Role of the Family, Child with the disability, parents of the disabled child. Acceptance of Severely disabled persons. Social-Sexual Relationships. Independent Living.

Introduction to Sociology and outline of Society, definitions, Outline of Social works, Nature of Social organization, types of organizations. Non-governmental organisations and its role in prosthetics & orthotics. Structure and functions of Social Institutions.

Village as a community. Social Changes, Social Problems, Social Welfare, Vocational Rehabilitation, Employment, Self-Employment Job analysis, Job placement.

Disability & Development:

Background to social, political and economic issues in India and other Low Income countries. Affect on poor who live in rural and urban areas.

Introduction to community based rehabilitation as compared to the existing medical model and its function.

Local resources available and referral. Income generation schemes, Purpose of Sangha/group of PWDs. Access, adaptations and change of environment where people live or work.

Removing Environmental Barriers, Recreation for the Disabled Community Welfare organizations, Social welfare programmes. Professional and social work in medical & rehabilitation set up. Practical and environmental difficulties of patients in use of appliances. Outline of Educational aspects, PWD act.

RECOMMENDED BOOKS & JOURNALS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Physical Medicine & Rehabilitation	Bredamm,s		
2.	Physical Medicine & Rehabilitation	Deliza		
3.	Neurological Rehabilitation	Carr, J.H. and Shepherd, R.B	Butterworth, Oxford	
4.	Handbook of Physical Medicine and Rehabilitation	Kottke, F.J. and Lehman J.F.	W B Saunders, London	
5.	Tetraplegia and Paraplegia	Bromley, Ida	Churchill-Livingston, London	

TITLE--- PROSTHETICS SCIENCE-II
COURSE CODE--- BPO 206
TEACHING HOURS --80
CREDITS --- As per affiliated university norms

DETAILED CONTENTS

Knee Joints: 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- pelvectomy – 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 techniques for through knee prosthesis, Cast modification, Fabrication Techniques of through hip prosthesis, through knee Gait analysis and deviations, Through knee Check-out Procedures.

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

Gait Deviations and Analysis: Trans Femoral Gait Analysis, Trans Femoral Check- out Procedures,



TITLE --- ORTHOTICS SCIENCE-II
COURSE CODE--- BPO 207
TEACHING HOURS --80
CREDITS --- As per affiliated university norms

DETAILED CONTENTS

Orthotics Components: Prescription principles of various types of Knee Orthoses (KO), Knee Ankle Foot Orthoses (KAFO), Hip Knee Ankle foot Orthoses (HKAFO). RGO & ARGO Orthoses

All types of K.A.F.O., H.K.A.F.O. FRO, RGO & ARGO etc. and also Orthoses for management of C.D.H., C.P., Paraplegics, Legg Calve perthes diseases, Spina Bifida, Leprosy and Hemiplegia etc.

Fabrication: 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.

Orthotics: Orthoses for sports injury, Reciprocating Gait Orthoses (RGO), Hip Guidance Orthoses(HGO), Fracture Cast Bracing, Swivel walker, orthopodium/ Parapodium. Weight relieving orthoses, Extension orthoses or Ortho-prostheses, PTB. Orthoses Orthotic management of Rickets and Knee Arthritis

RECOMMENDED BOOKS & JOURNALS

Sl. No.	Title	Author	Publisher
1.	Prosthetics & Orthotics	Shurr. G. Donald&J.W.Michel	
2.	Prosthetics & Orthotics LowerLimb& Spine	Seymour, Ron	
3.	Amputations & Prosthetics	May Bella J.	Jaypee Publisher New Delhi
4.	Orthotics in functional rehabilitation of the lowerlimb	Nowoczenski, Deborah A.	

5.	Atlas for prosthetic rehabilitation,	American Academy of Orthopaedic Surgeons	Mosby publications/ or N.Y.U. St. Louis, London, Chicago
	Surgery and limb deficiency.		
6.	Hydraulics and pneumatics	Parr, Andrew	
7.	Foot and ankle in sports	Bates, Andrea	
8.	Functional fracture bracing	Sarmiento, A.	
9.	AAOS atlas of Orthosis and assistive devices,	Hsu, John D.	Mosby publications/ or N.Y.U. St. Louis, London, Chicago
10.	Maintenance and care of the prosthesis	C.A. Harnesseg	
11.	Manual for lower Extremity prosthetics Publisher : Mosby		Mosby publications/ or N.Y.U. St. Louis, London, Chicago
12.	Hip disarticulation Prosthesis	C.A. Melancik	
13.	FOOT ORTHOSIS	Kent, Wu	
14.	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	Jan Bruckner and Joan Edelstein	
15.	An Atlas of Lower Limb Orthotic Practice	D.N. Condie and S. Turner	
16.	Orthotics and Prosthetics in Rehabilitation	Michelle M. Lusardi PhD PT and Caroline C. Nielsen PhD	

17.	Orthotics in Functional Rehabilitation of the Lower Limb	Deborah A. Nawocze	
18.	Orthology: Pathomechanics of Lower- Limb Orthotic Design	American Academy of Prosthetists & Orthotists	

19.	Introduction to microprocessor	Mathur U.N. Dhur A.P	Mac-Graw Hill Inc. New Delhi
20.	Orthotics Etcetera	John B Redford	
21.	New Advances in Prosthetics and Orthotics	Mark H Bussell	
22.	Manual of Lower Extremity Orthotics	AAOS	Springfield
23.	Prosthetic & patient management	Kevin Croll	
24.	The Immediate post- operative Prosthesis in L.E E. Amputation	Andrew C. Ruoff & Others	
25.	Congenital Limb Deficiency	Charles A Frank	
26.	Above Knee Amputation- Prosthetic Principles & Practice	Zems Grim	
27.	Hemipelvectomy Prosthesis	Fred Hampton	
28.	Hip Disarticulation Prosthesis	C. A. Mclaucik	
29.	Powered Lower Limb Orthotics in Paraplegia	J. Hughes	
30.	Bio-mechanical basis of Orthotics Management	P. Bowker, D.N. Conde D.L. Bader, D.J. PRATT	Butterworth- Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP

TITLE--- PROSTHETICS SCIENCE-II
COURSE CODE--- BPO 251
TEACHING HOURS -- 260 (Practical)
CREDITS --- As per affiliated university norms

Prosthetics Practical: all types of above Knee prosthesis and through knee prosthesis. Silicone Cosmetic prosthesis on model / mannequins

TITLE --- ORTHOTICS SCIENCE-II
COURSE CODE--- BPO 252
TEACHING HOURS --260
CREDITS --- As per affiliated university norms

Practical: 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.

Note: The orthoses to be fabricated on model / mannequin's

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THIRD YEAR

TITLE --- COMPUTER SCIENCE & GRAPHICAL COMMUNICATION
COURSE CODE--- BPO 301
TEACHING HOURS - 80 (Practical -120)
CREDITS --- As per affiliated university norms

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

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

Describe the advanced application of computer in prosthetics and orthotics field.

Design various components for prosthetics and orthotics use.

Make use of computer knowledge in the statistics data analysis and documentation.

Describe the principles of computer aided design(CAD) & computer aided manufacture(CAM)

DETAILED CONTENTS

Dimension on technical drawing , indication of linear and angular tolerance, methods of dimensing and toleracing, cone methods of indicating surface texture on technical metal work

Orthographic projections, points, line and simple objects, Orthographic and isometric projection of P & O components

Introduction to computers and Components of computers: Physical Composition, Central Processing Unit, Main Memory, Input and Output units and alsoall kinds of common types of computer peripherals.

Hardware: Various Configurations, Specification of peripherals and computer system. Various types of storage facilities and its advantages and disadvantages.

Computing environments: Introduction to types of computers- Personal computers, Main frame and super computers, Networks, E-Mail, Internet. Introduction to operating systems, e.g. DOS, Windows, Linux, Unix, commands and introduction to General file systems.

Software: The current operating software's, Word Processor, spreadsheet, data base and presentation software, e.g. Windows XP or Windows 2000 Professional, Microsoft Office XP or 2000 Professional etc., upgraded as used currently, Anti Virus.

Basic Engineering Drawing:

Computer Aided Design & Manufacturing (CAD & CAM)

Basics of CAD: Introduction, Definition, History, Current status, Product Cycle, Automation, Designing, Application and Benefits. Computer Graphics: Introduction of software, Function of graphic package, Application Software. AutoCad updated version: Introduction, Foundation of AutoCad Commands, Execution of Simple 2D Drawings, Understanding 3D commands, Executing 3D Commands, Creating 3D objects Rendering and Image attach to an object Starting New Projects, Creating, Editing, Saving Drawing, Annotation, Dimension, Plotting, Customisation, Auto Lisp.

Introduction to CNC, History of CNC, Advantages and disadvantages of N/C, CNC, DNC, Major part of CNC.

Basics of CAM: Introduction of CNC machine, basics of Computer Aided Designing and Manufacturing (CAD/CAM) and its use in P&O. Other kinds of Computer use in Prosthetics and Orthotics. CAD/CAM Technology in socket making and also making of different kinds of orthosis and prosthesis.

CAD/CAM in Prosthetics & Orthotics: types of digitizers used, concept of different types of modifying software, CNC carver and its specification, step wise fabrication procedure of sockets, shells and spinal orthoses, its advantages and disadvantages

RECOMMENDED BOOKS & JOURNALS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	Mc Mohan, Chris	CAD, CAM		
2.	Zeid Ibrahim	CAD/CAM theory and practice	B. I. Publications P New Delhi	
3.	Satish Jain	Computer course	Pub: BPB New Delhi	
4.	Satish Jain	Computer Organisation & system Software	Pub: BPB New Delhi	
6.	Hammandlu	Computer graphics	Pub: BPB New Delhi	
7.	BPB	Operating systems	Pub: BPB New Delhi	
8.	C.D	Auto CAD 2007 for engineers & designers		
9.	C.D	Sensor technology handbook		

TITLE ---BIO-MECHANICS-III
COURSE CODE--- BPO 302
TEACHING HOURS -70
CREDITS --- As per affiliated university norms

DETAILED CONTENTS

Biomechanics of Hand, wrist complex, elbow complex & shoulder complex.

Upper Limb: Grasp patterns, grasp forces, mechanical replacement of hand function, augmentation of deficient hand function, upper limb prosthetic socket biomechanics – all types, Orthosis biomechanics, application of external power, myoelectric control of external power and usage of devices.

Control systems: Introduction to control theory. Application in Prosthetics and Orthotics of functional electrical stimulation (FES), hybrid orthosis, myoelectrics and bio-feedback.

Spinal Biomechanics: Motions of the spine, Biomechanics of different region in spinal column, Biomechanics Inter vertebral disk, Lumbar Spine loading during normal activities and effects of Orthosis on this loads, Biomechanical Principles of spinal orthosis, Biomechanics of Corsets, Cervical/ thoraco/lumbar/sacral spinal orthosis. Biomechanics of scoliosis correction using different technologies and especially using Spinal orthosis.

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. Design test standards/materials/Philadelphia Loads/ISO. Design calculations for P&O devices. Practical: Different ways of design tests, use of FES and myoelectric control system in P&O devices.

Combined and torsional stresses, combined axial bending torsional stresses. Open and closed helical springs, beam deflection. Design test standards/materials/Philadelphia Loads/ISO. Design calculations for P&O devices/BIS. Column of the spine, biomechanics of spinal injuries, follower load, Euler's theory of buckling

RECOMMENDED BOOKS & JOURNALS

BIOMECHANICS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	P. Bowker, D.N. Conde, D.L. Bader, D.J.PRATT	Bio-mechanical basis of Orthotics Management	Butter worth- Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP	
2.	Humphrey, Jay D.	Introduction to biomechanics		
3.	Hamill, Joseph	Biomechanical Basis of human movement		2 nd ed.
4.	Rose, Jessicaed.	Human walking		
5.	Soderberg, L.ed.	Kinesiology		
6.	Hoffoman shirt J. ed.	Introduction of Kinesiology		2 nd ed.
7.	Tyldesley, Barbara	Muscles, nerves &movement		3 rd ed.
8.	Perry, Jacuelin	Gait analysis		
9.	Tozeren, Aydin	Humanbody dynamics		
10.	Harries, G.F.ed	Humanmotion analysis		
11.	Dvir, Zeevi	Clinical biomechanics		
12.	Hall Susan J	Basic Biomechanics	McGraw-Hill	
13.	Hausdorff, Alexander Jeffrey M, Neil B	Gait disorders	B. I. Publications P	
14.	Duane Knudson	Fundamentals of Bio- Mechanics		2nd ed.
15.	StanleyBell P Frank	Principles of mechanics and biomechanics	B. I. Publications uk	
16.	Black Jonathan	Clinical Biomechanics		

17.	Donatelli, R.A.	Biomechanics of the Foot and Ankle	Davis, Philadelphia	
18.	Kapandgi, I.A.	Physiology of Joints	Churchill- Livingstone	Vol. I, II & III



TITLE----ASSISTIVE TECHNOLOGY
COURSE CODE--- BPO303
TEACHING HOURS -80
CREDITS --- As per affiliated university norms

Course description: Students would learn about the use of various types of mobility aids required by PWDs and related analysis of the gait pattern.

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

- Explain the prescription of commonly used mobility aids like crutches, walking stick, and walkers. Assess and prescribe the best possible mobility solution for a wheelchair user
- Carry out repair and maintenance of wheelchair
- Describe the correct use of the wheelchairs, transfers and various modifications of wheel chairs
- Train users to make the best use of their wheelchair.
- Assess, prescribe and fabricate different types of developmental aids
- Describe the analysis of gait with the related mobility aids.

DETAILED CONTENTS

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

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

Molded seats: Biomechanics of various kinds of molded seats, prescription criteria, cast and measurement techniques, Cast modifications, fabrication of molded seats with inside or outside posting, use of different materials and technologies to fabricate the same, suspension or right kinds of strapping.

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

Cushions and its fabrication technique & wheelchair modification.

Other types: Introduction: Motorized wheelchair, tricycle and motorized tricycle, modified two wheeler for mobility. Robotics Arms,

Gait Training with various walking aids, Installation/ fabrication of Parallel bars.

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

RECOMMENDED BOOKS & JOURNALS

TITLE----- RESEARCH METHODOLOGY&BIostatISTICS
COURSE CODE--- BPO 304
TEACHING HOURS -60
CREDITS --- As per affiliated university norms

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

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

- Explain the process, types, design, needs, 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

DETAILED CONTENTS

Introduction to Biostatistics

1. Definition – Statistics, Biostatistics
2. Applications of Biostatistics
3. Data collection from experiments & surveys.
4. Variable – Qualitative & Quantitative, Discrete and continuous.
5. Presentation of Data: -
 - a) Tabular Presentation of Data – Statistical Table, Format of a Table.

b) Frequency Distribution – construction of Frequency Distribution, cumulative and relative frequency distribution, Exclusive and inclusive method of classification of Data.

c) Diagrammatic Presentation of Data: - Bar diagrams, Pie Diagram, Line Diagram, Pictogram, Cartogram or Statistical map.

d) Graphical representation of a Frequency distribution – Histogram, Frequency Polygon, Frequency curve, ogives or cumulative frequency curves.

Research methodology:

1. Introduction to Research methodology: Meaning of research, objectives of research, Types of research & research approaches,

2. Research problem: Statement of research problem Statement of purpose and objectives of research problem, Necessity of defining the problem

3. Research design: Meaning of research design, Need for research design,

4. Sampling Design: Criteria for selecting sampling procedure

5. Measurement & scaling techniques: Measurement in research- Measurement scales, sources of error in measurement,

6. Methods of data collection: collection of primary data.

7. Sampling fundamentals, need for sampling

8. Analysis of data:, Types of analysis.

9. Testing of hypothesis: What is hypothesis? Basic concepts concerning testing of hypothesis.

RECOMMENDED BOOKS & JOURNALS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	Armstrong H.B.	Critical Moments in Quantitative Research	Butter worth- Heine Oxford	
2.	R.M. Scot	Orthotic system & research		

TITLE --- PROSTHETICS SCIENCE-III
COURSE CODE--- BPO 305
TEACHING HOURS --90
CREDITS --- As per affiliated university norms

DETAILED CONTENTS

Upper Limb: Grasp patterns, grasp 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 bio-feedback.

Upper limb prosthetics: Historical development in Upper Limb Prostheses – India and abroad, Upper Extremity Prosthetics Components - Terminal devices, Wrist units, Elbow units, Shoulder units, Harnessing systems in Upper extremity prosthesis.

Partial Hand: passive, cosmetics and functional types which also includes silicon prostheses. Cosmetic hand gloves and fingers. Devices for augmentation of function and cosmetics for partial hand amputation 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: Prescription Criteria, Types of Trans Radial prosthesis – Components, Types of Socket which includes Self suspending, flexible/rigid socket or combination of both, Clinical Considerations, Casting and measurement techniques, Cast modifications, Fabrication techniques – single wall and double wall, 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: Prescription Criteria, Types of Trans Humeral prosthesis which also includes Elbow Disarticulation prostheses – Components, Different types of Elbow Mechanisms. Types of Socket which includes Self suspending, flexible/rigid socket or combination of both, Clinical Considerations, Casting and measurement techniques,

Cast modifications, Fabrication techniques – single wall and double wall, 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: Prescription Criteria, Types of prosthesis both 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, Fitting, donning and doffing techniques. Checkout procedures, Testing and Training.



TITLE----ORTHOTIC SCIENCE-III
COURSE CODE--- BPO 306
TEACHING HOURS --80
CREDITS --- As per affiliated university norms

DETAILED CONTENTS

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 principal of all types of upper limb Orthotics. Material used and its 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 rheumatic 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 which also includes 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.

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RECOMMENDED BOOKS & JOURNALS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Prosthetics & Orthotics	Shurr. G. Donald&J.W.Michel		2 nd ed.
2.	Atlasfor prosthetic rehabilitation, Surgeryandlimb deficiency.	AmericanAcadem y of Orthopaedic Surgeons	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	3 rd
3.	Orthotics	Edestein, Joan E.	Jaypee Publisher New Delhi	
4.	AAOS atlas of Orthosis and assistive devices,	Hsu, John D.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	4 th ed.
5.	Maintenanceandcare of the prosthesis	C.A.Hannesseg		
6.	Manualfor Upper Extremity Prosthesis	William R.SANTASHI Edn		
7.	Orthotics and Prosthetics in Rehabilitation	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD		
8.	Guidelines for Prescribing Foot Orthotics	Mark A. Reiley		
9.	Orthotics inFunctionalRehabilit ation of the LowerLimb	Deborah A. Nawocze		
10.	Hand and Upper Extremity Splinting : principles and methods	Fess,Gettle,Philips ElaineEwing,KaranS, Cynthia A	Elsevier Mosby St. Luis B. I. Publications P	
11.	Powered upper limbprosthesis	AmericanAcademy of Prosthetists&Orthoti sts		
12.	Upper Extremity Orthotics	Anderson, Miles H.	Jaypee Publisher New Delhi	
13.	New Advances in Prosthetics and Orthotics	Mark H Bussell		
14.	Prosthetic &patientmanagement	KevinCroll		1 st

TITLE ---PRACTICAL PROSTHETICS SCIENCE-III
COURSE CODE--- BPO 351
TEACHING HOURS -340
CREDITS --- As per affiliated university norms

Prosthetics Practical: Fabrication of prosthesis for partial hand amputation or congenital absence, through wrist prosthesis, Below Elbow prosthesis, Above Elbow prosthesis, Shoulder Disarticulation prosthesis, Elbow Disarticulation prosthesis – preferably using various available technologies.

Practical: Different ways of design tests, use of FES and myoelectric control system in P&O devices.

TITLE ----PRACTICAL ORTHOTICS SCIENCE-III
COURSE CODE--- BPO 352
TEACHING HOURS -300
CREDITS --- As per affiliated university norms

Orthotics Practical: Fabrication of at least 5 types of splints belonging to each group on model / mannequins

TITLE --- PRACTICAL COMPUTER SCIENCE
COURSE CODE--- BPO 353
TEACHING HOURS --120
CREDITS --- As per affiliated university norms

Practical:

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

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

FOURTH YEAR

TITLE----PROSTHETICS SCIENCE-IV
COURSE CODE--- BPO 401
TEACHING HOURS -60
CREDITS --- As per affiliated university norms

DETAILED CONTENTS

Hip Disarticulation Prosthesis: Various types of through hip Prosthesis. Prescription principles, Materials and components to be used, Casting and measurement techniques, Cast modification, alignment, suspension, Fitting, donning and doffing techniques. Check out procedures, Testing and Training. Through hip Gait analysis and deviations.

Prosthetics: Bilateral Stubbies. Bilateral Prosthesis. Trans Lumber Prosthesis (Sitting and Standing), Prosthesis for Child Amputee, Prosthesis for Congenital anomalies, Prosthesis adaptation for sports and recreation, Immediate post surgical fittings, Check-out Procedures.

TITLE----- ORTHOTICS SCIENCE-IV
COURSE CODE--- BPO402
TEACHING HOURS -80
CREDITS ---

Spinal Orthoses: Historical development of spinal orthoses. Anatomical and Physiological Principles of construction and fitting of spinal Orthoses. Biomechanical principle and Functions of spinal Orthoses. Indications and contraindications for spinal orthosis

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.

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 under arm orthoses and variants. Various types of Immobilisers, Fitting,

donning and doffing techniques. Checkout procedures, Testing and Training. Lumbo sacral Orthoses: Principle, material, measurement/ casting, fabrication of all types of Lumbo sacral 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

RECOMMENDED BOOKS & JOURNALS

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	Shurr. G. Donald&J.W.Michel	Prosthetics & Orthotics		2 nd ed.
2.	Seymour, Ron	Prosthetics & Orthotics LowerLimb& Spine		
3.	AmericanAcademy of Orthopaedic Surgeons	Atlasfor prosthetic rehabilitation, Surgeryandlimb deficiency.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	3 rd
4.	Hsu, John D.	AAOS atlas of Orthosis and assistive devices,	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	4 th ed.
5.	C.A.Melancik	Hip disarticulation Prosthesis		
6.	KentonD.Leatherman Rober A. Dickson	The Management of Spinal deformities	Butter worth-Heinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	
7.	E.F.Murphy	Principal in Prosthetic managementforMultiple handicapped		
8.	Jan Bruckner and Joan Edelstein	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM		
9.	D.N. Condieand S. Turner	An Atlas of Lower Limb Orthotic Practice		
10.	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation		
11.	Deborah A. Nawocze	Orthotics inFunctionalRehabilitati on of the LowerLimb		
12.	AmericanAcademy of Prosthetists&Orthotists	Orthology: Pathomechanics of Lower-Limb Orthotic Design		

TITLE-----MANAGEMENT & ADMINISTRATION
COURSE CODE--- BPO 403
TEACHING HOURS -60
CREDITS --- As per affiliated university norms

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

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

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

DETAILED CONTENTS

Introduction: Principles of Administrative and Management structure, Industrial Management, Definition of Organization. Principles of good organisation, type of Organisational setup Workshop Administration and management.

Management: Introduction, Discipline, Security, distribution of work, Work sheet, Time sheet and staff Welfare. **Material Management:** Store and store organization. **Inventory Control.** Purchase organization. Introduction to cost accounting. Use of computer for effective store management.

Safety: Industrial accidents, safety and hazards **Planning:** Planning of Prosthetics and Orthotics Departments at various levels, all types of various scales. Layout, plant Layout. Costing, billing, documentation especially development of recording system to manage individual's records. **Leadership.** Human resource management & **Environmental Science:** Hospital waste disposal. Role of the International Health Agencies

Economics: Business management practices such as cost calculations, accounting process and budgeting address issues related to clinic management including, appointment

systems and record keeping, Quality control and the use of quality assurance system
Appropriate code of ethical behaviour of P & O Professionals

Introduction of administration, Nature and scope of administration, How to be an effective administrator, Principles of administration and its applications to Prosthetics and orthotics setup. Rules of Professional Conduct.

TITLE---- PROSTHETICS SCIENCE-IV
COURSE CODE--- BPO 451
TEACHING HOURS --160
CREDITS --- As per affiliated university norms

Practical: Fabrication of Prosthesis for through hip, double or multiple amputees on model/ mannequins, Fitting of Prosthesis in cases and developing and/or adapting new designs.

TITLE----- ORTHOTICS SCIENCE-IV
COURSE CODE--- BPO 452
TEACHING HOURS --160
CREDITS --- As per affiliated university norms

Practical: Fabrication of all types of orthoses on model / mannequins

TITLE --- PROSTHETICS CLINICAL PRACTICE
COURSE CODE--- BPO 453
TEACHING HOURS - 250
CREDITS --- As per affiliated university norms

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

The student will develop skills in the:

- communication
- assessment and prescription;
- clinical provision of prostheses and orthoses;
- manufacture of prostheses and orthoses;
- interpersonal relationships;
- organisation and management;
- Clinical research.
- Contributing too and learning from the clinic team.

PROSTHETICS CLINICAL PRACTICE

Direct Service: In this period each trainee will be in touch directly with the persons with disabilities under supervision of the Instructor/Demonstrator. She/he would do all the necessary work from start to the finish for fittings of suitable prostheses. Each person fitted with prostheses has to be documented/ recorded well and to be presented in the clinics in front of health care team and other trainees. Besides fitting, trainee would also work with other rehabilitation team members to understand “Total Rehabilitation”.

TITLE----ORTHOTICS CLINICAL PRACTICE
COURSE CODE--- BPO 454
TEACHING HOURS - 250
CREDITS --- As per affiliated university norms

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

The student will develop skills in the:

- communication
- assessment and prescription;
- clinical provision of prostheses and orthoses;
- manufacture of prostheses and orthoses;
- interpersonal relationships;
- organisation and management;
- Clinical research.
- Contributing too and learning from the clinic team.

ORTHOTICS CLINICAL PRACTICE

Direct Service: In this period each trainee will be in touch directly with the persons with disabilities under supervision of the Instructor/Demonstrator. She/he would do all the necessary work from start to the finish for fittings of suitable prostheses. Each person fitted with prostheses has to be documented/ recorded well and to be presented in the clinics in front of health care team and other trainees. Besides fitting, trainee would also work with other rehabilitation team members to understand “Total Rehabilitation”.

TITLE----PROJECT WORK
COURSE CODE--- BPO
TEACHING HOURS --- 180
CREDITS --- As per affiliated university norms

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

Suggestive Reading (Indian Authors)

List of Reference books in Hindi/Indian Authors for BPO

Sr.No	Title	Author
1	3D printing in Prosthetics and Orthotics- Innovations and Opportunities	Dr. Salman Shaikh
2	Prosthetics and Orthotics in Rehabilitation Management	Sh. Tarik Kumar Datta
3	Prosthetics Concepts Question Based Learning Approach	Sh. Rishabh Gupta and Ms. Yamini Khanna
4	Question Bank of MCQs in Orthotics	Sh. Rishabh Gupta, Ms. Yamini Khanna
5	Hand Book of Silicone Prosthesis	Ms. Smita Nayak Prasanna Lenka
6	Text Book of Computer Science for Prosthetics & Orthotics	Shri S.K. Panda

V. ADEQUACY OF THE SYLLABUS

The syllabus prescribed for the B.P.O. is on the basis of minimum requirements and therefore, Universities and Institutes implementing the B.P.O. programme can exercise flexibility in opting the number of papers without compromising on the adequacy and validity of the contents prescribed by the RCI.

VI. DURATION OF THE PROGRAMME

The duration of the programme is of four and half academic years (inclusive of 6 months of internship), which can be completed in a maximum of 6 years from the date of admission to the programme.

VII. WORKING DAYS & ATTENDANCE

The programme will be conducted for **at least 240 working** days each year exclusive of the period of examination and admission. The institution shall work for a minimum of thirty six hours in a week (five or six days), during which physical presence in the institution of all the teachers and student clinician is necessary to ensure their availability for advice, guidance, dialogue and consultation as and when needed.

No student will be allowed to appear in the examination unless she/he has attended at least 75% of total number of classes in theory and 80 % in practical.

100% attendance in internship is compulsory.

VIII. ELIGIBILITY FOR ADMISSION

A. Candidate who has passed 10+2 in science or equivalent with physics, chemistry biology/ mathematics, and English with minimum aggregate 50% marks in PCBE/PCME will be eligible for admission to this course. Relaxation and reservation for SC/ST/OBC/PwD and other categories shall be as per the rules/instructions of the Central Govt /State Govt whichever is applicable.

B. Lateral Entry for Diploma in Prosthetics and Orthotics (D.P.O.)holders

- ✓ Candidates who have passed D.P.O. from a RCI recognized institute shall be eligible for admission directly in 3rd year i.e., 5th Semester of B.P.O. Programme.
 - ✓ Admissions will be on the availability of the seats within sanctioned seats by the Council.
 - ✓ In-service candidates may be permitted to undergo internship at their parent organization.
- Admission process as per affiliating University norms.

All reservations in admission will apply as per Govt. rules for aided and Govt. institutions. The infrastructure will have to be enhanced as per the seats getting increased under reservation policy.

IX. PROGRAMME PATTERN

The programme has been developed on Annual basis.

X. EXAMINATIONS

As per the respective University norms. Minimum passing marks for every subject will be 50% both in theory and practical. Each candidate will be given maximum n+ 2 attempts to clear the examination whether annual or semester.

X.1 Eligibility to appear for exams

- Candidate having 80% attendance in theory and practical in all the subjects and Minimum required internal assessment marks and registered for examination are eligible for promotion to next higher class up to final year.
- The candidates shall be eligible to write the fourth year examination only after clearing all the papers of the first, second and third year examinations.
- The candidates shall be eligible for internship only after clearing the final year examinations.

X.2 Schedule of Regular/Supplementary exams

There will be two examinations in a year (regular and supplementary), to be conducted as per notification issued by university from time to time. First, second, third and final Examinations of the BPO course shall be held at the end of first year, second year, third year and fourth year respectively. Supplementary examination shall be conducted by the university for the benefit of unsuccessful candidates. The supplementary examination shall be conducted within six months from the date of announcement of results.

X.3 Scheme of examination showing maximum marks and minimum marks

FIRST YEAR - Bachelor of Prosthetics and Orthotics														
Paper & subjects	Theory						Practical						Grand Total	
	University		Internal		Total		University		Internal		Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Anatomy	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Physiology	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Workshop Technology & Material Science	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Applied Mechanics & Strength of Materials	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Biomechanics - I	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Basic Electronics	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Prosthetics Science - I	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
Orthotics Science - I	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
TOTAL													1000	500

SECOND YEAR - Bachelor of Prosthetics and Orthotics														
Paper & subjects	Theory						Practical						Grand Total	
	University		Internal		Total		University		Internal		Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Pathology	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Orthopaedics, Amputation Surgery and Imaging Science	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Community Rehabilitation and Disability Prevention	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Biomechanics II	80	40	20	10	100	50	-	-	-	-	-	-	100	50

Psychology and Sociology	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Prosthetic Science II	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
Orthotic Science II	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
Pharmacology	80	40	20	10	100	50	-	-	-	-	-	-	100	50
TOTAL													1000	500

THIRD YEAR - Bachelor of Prosthetics and Orthotics

Paper & subjects	Theory						Practical						Grand Total	
	University		Internal		Total		University		Internal		Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Computer Science and Graphical Communication	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
Biomechanics III	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Assistive Technology	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Research Methodology and Biostatistics	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Prosthetic Science III	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
Orthotic Science III	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
TOTAL													900	450

FOURTH YEAR - Bachelor of Prosthetics and Orthotics

Paper & subjects	Theory						Practical						Grand Total	
	University		Internal		Total		University		Internal		Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Prosthetic Science IV	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
Orthotic Science IV	80	40	20	10	100	50	75	37.5	25	12.5	100	50	200	100
Management and Administration	80	40	20	10	100	50	-	-	-	-	-	-	100	50
Prosthetics Clinical Practice	80	40	20	10	-	-	75	37.5	25	12.5	100	50	200	100
Orthotics Clinical Practice	80	40	20	10	-	-	75	37.5	25	12.5	100	50	200	100
Project Work	-	-	-	-	-	-	75	37.5	25	12.5	100	50	100	50
TOTAL													1000	500

X.4 Papers in each year

First Year:

1. Anatomy
2. Physiology

3. Workshop Technology & Material Science
4. Applied Mechanics & Strength of Materials
5. Biomechanics – I
6. Basic Electronics
7. Prosthetics Science – I
8. Orthotics Science - I

Second Year:

1. Pathology
2. Orthopaedics, Amputation Surgery and Imaging Science
3. Community Rehabilitation and Disability Prevention
4. Biomechanics II
5. Psychology and Sociology
6. Prosthetic Science II
7. Orthotic Science II
8. Pharmacology

Third Year:

1. Computer Science and Graphical Communication
2. Biomechanics III
3. Assistive Technology
4. Research Methodology and Biostatistics
5. Prosthetic Science III
6. Orthotic Science III

Fourth Year:

1. Prosthetic Science IV
2. Orthotic Science IV
3. Management and Administration
4. Prosthetics Clinical Practice
5. Orthotics Clinical Practice
6. Project Work

X.5 Details of theory exams

Question paper pattern for BPO theory examination

Maximum Mark-80		
Type of question	Number of questions	Marks for each question
Essays	2	15
Short essays	7	5
Short Answers	5	3

Essay should be explanatory. Short Essay should be descriptive and short answers should be based on direct recollection.

X.6 Model question paper for each subject with question paper pattern

Refer Annexure IX.1

X.7 Internal assessment component

- There shall be a minimum of 3 periodic assessments, for theory and practical including viva separately, of which the final one will be University model examination and is mandatory to appear.
- Average of the marks of the best two periodic assessment shall be taken as internal assessment mark of the candidate.
- The class average of internal assessments mark of theory and practical should not exceed 75% of Maximum marks for regular examinations and 80% for supplementary examination.
- The class average of internal assessment for an exam shall be calculated based on the total number of candidates in a particular batch appearing for that internal assessment examination.
- The candidate must secure the minimum 50%marks for internal assessment in theory and practical separately in each subject in order to be eligible to appear in the university examination of the subject.
- In cases where the candidate is permitted to improve the internal assessment marks, the new marks will be taken as final.
- Each student should maintain a logbook and record the procedures they do and the work patterns they are undergoing. It shall be based on periodical assessment, evaluation of student assignment, preparation for seminar, clinical case presentation, assessment of candidate's performance in the sessional examinations, routine clinical works, logbook and record keeping etc.

X.8 Number of examiners (Internal & External) and their qualifications

There will be two examiners for each subject where practical/ or viva to be conducted. One examiner (INTERNAL EXAMINER) is preferably from the same institution or as Decided by the KUHS and the other examiner will be from another zone of KUHS (EXTERNAL EXAMINER).

XI. FACULTY-STUDENT RATIO

The faculty-student ratio in the area of B.P.O may be as per the RCI norms.

XII. BPO TEACHING FACULTY NORMS:

Senior faculty in the discipline of Prosthetics and Orthotics shall be considered as course coordinator. The coordinator should be the controlling and informant authority for the correspondence related to the BPO program.

He/she should hold qualification as laid down by RCI.

18.1. Clinical Facilities

Facilities for diagnostic evaluation of locomotor impairment and associated disorders, both functional and organically based. Clients of all age groups with locomotor impairment.

Load and variety of patients/ clients should be commensurate with number of courses conducted and also to meet the clinical practicum requirement of each year of the course.

XIII. CERTIFICATION AS A REGISTERED PROFESSIONAL

It is mandatory as per Section 13 of RCI Act for every Prosthetist and Orthotist to obtain a “Registered Professional Certificate” from the Rehabilitation Council of India to work in the field of Prosthetics and Orthotics in India. As continuous professional growth is necessary for the renewal of the certificate, the faculty as well as Prosthetist and Orthotist should undergo in-service programme periodically to update their professional knowledge. Amendments, if any, to the regulations of the course will be made periodically by the Rehabilitation Council of India. Any deviation from the above regulations should have the prior approval of the Rehabilitation Council of India.

The successful students will be registered as Prosthetist and Orthotist (Professional). The training institution/organization should take appropriate action to ensure that all passed out students are registered with the Council.

XIV. AWARD OF DEGREE

After successful completion of all examinations and internship candidate will be awarded with the degree of Bachelor in Prosthetics and Orthotics (B.P.O.). The said degree will be classified in accordance with the affiliating University norms.

XV. CLINICAL PRACTICUM-

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

- Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal prosthetic and orthotic solution using information from the patient assessment, other members of the health care 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 health care team.
- Reliably measure and capture a positive cast or image of patient / clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
 - Identify, prescribe and justify selection of appropriate materials and componentry in the fabrication of the prostheses or orthoses.
 - Construct the prostheses or orthoses using appropriate fabrication techniques in preparation for the initial fitting.
 - Fit the prostheses or orthoses to the patient using static and dynamic functional criteria established from the original assessment.
 - Evaluate the quality of the prostheses or orthoses fit to ensure the appropriate interface contouring, force application and trim lines.
 - Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
 - Assess and solve prosthetic or orthotic problems as part of short and 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 prostheses or orthoses.
 - Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the patient at the centre.

XVI. INTERNSHIP

1. Internship is compulsory.
2. Duration: 6 months
3. Eligibility: Internship will start immediately after the declaration of result of final year/ semester & candidate is declared pass in all four years / eight semesters
4. Structure and duration of the postings:
 - i) The place of postings of the students for internship will be decided by the respective institute conducting the course.
 - ii) Students should spend minimum of 50% period of internship at parent institute and upto 50% period outside the parent institute like hospital set ups, educational set ups, special clinical facilities. Exposure should be for those areas where limited exposure was provided in the parent institute.
5. Mode of supervision during internship: Supervision should be provided by a Qualified Prosthetics and Orthotics Professional.
6. Maintenance of records by students: Every student should maintain records of the number of hours of clinical work in different areas and institutions. This

should be certified by the head of the department/organisation/ institution or his/her nominee where the student is undergoing internship.

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

8. Stipend: As per the norms of the parent Institute.

9. Grading and evaluation of student: Grading and evaluation should be done by the institute where the candidate is doing internship. The student will be required to repeat those postings in which his/her performance is found unsatisfactory.

10. Certification: The parent institute/affiliating University will award a certificate after successful completion of the internship.

11. The University shall award the degree certificate only after the successful completion of the internship.

IX. ANNEXURES

IX.1 Model Question Papers

FIRST YEAR BPO EXAMINATIONS

(Model Question)

ANATOMY

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays: (2x15=30)

1. Describe the Hip joint under the following headings:
(a) Type (b) Articulation (c) Ligaments (d) Movement. (15 marks)
2. Describe the formation of the brachial plexus . (15marks)

II. Short Essays:

(7x5=35)

3. Classify bones.
4. Functions of peritoneum
6. Elbow joint.
7. Facial nerve
8. Femoral triangle
9. Cubital Fossa
10. Median nerve

III. Brief notes:

(5X3=15)

1. Deltoid muscle
2. Blood supply of stomach
3. Name the carpal bones
4. Ear ossicles
5. Radial nerve

FIRST YEAR BPO EXAMINATIONS

(Model Question)

PHYSIOLOGY

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays:

(2X15=30)

1. Define cardiac cycle. Explain the mechanical events taking place during each cycle. Add a note on ventricular pressure volume curve. (15)
2. Describe the pathway for pain. What is meant by referred pain? (15)

II. Short Essays

(7X5=35)

1. Temperature regulation.
2. Neurophysiology of Pain
3. Chemical regulation of respiration.
4. Synapse and its role in nervous system.
5. Functions of basal ganglia.
6. List the Composition and functions of Blood
7. Describe the features of UMN lesion

III. Brief Notes:

(5x3=15)

- 1 Spirometry
- 2 Lung compliance
- 3 Cardiac output
- 4 13. Anaemia
- 5 15. Oxyhaemoglobin

FIRST YEAR BPO EXAMINATIONS

(Model Question)

APPLIED MECHANICS AND STRENGTH OF MATERIALS

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays: (2x15=30)

1. With neat sketch, describe the various types of beams with different loads. **(15marks)**
2. Control Theory and its applications in Prosthetics and Orthotics. **(15marks)**

II. Short essays:

(7x5=35)

3. Newton's Laws of Motion.
4. State and derive Lami's Theorem.
5. Hooke's Law and Elastic Limit.
6. Torque, Friction, moment of Inertia.
7. Safety Factor and Pollution.
8. Open Helical Spring and its diagram.
9. Ergonomics Principles with examples.

III. Brief notes:

(5X3=15)

10. Scalar and Vector Quantity.
11. Force and Force Systems.
12. Strain.
13. Bending Moment.
14. Control Systems.

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FIRST YEAR BPO EXAMINATIONS

(Model Question)

WORKSHOP TECHNOLOGY AND MATERIALS SCIENCE

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. ESSAYS TYPE

2 x 15 = 30 Marks

1. What do you mean by properties of metal? Explain any 4 properties of metals. Explain the different kinds of welding
2. Discuss about different types of files and draw a neat sketch.

II. SHORT ESSAYS TYPE

7 X 5 = 35 Marks

1. What is Poly Vinyl Chloride (PVC) and mention its role in orthotic field?
2. Write the difference between Hot gas welding and Hot plate welding.
3. Explain about Plasticity and Ductility.
4. What is the difference between thermosetting plastic and thermoplastic?
5. Write about milling machine and mention types of milling machine.
6. What are different types of materials used in P&O field? Write one application of each.
7. Explain Safety gadgets in workshop

III. BRIEF NOTES

5 x 3 = 15 Marks

1. Mention the setting time of Plaster of Paris and factors affecting it.
2. What is surface coating of metals?
3. Define use of outside caliper.
4. What is Drill bit?
5. Write any three uses of plaster of Paris.

FIRST YEAR BPO EXAMINATIONS

(Model Question)

BIOMECHANICS

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

Time: 3 Hours

Max Marks: 80

- I. Long Answer questions: $3 \times 10 = 30$
1. Define and Explain planes and axis. Briefly explain movements occur in different planes
 2. Describe in details the biomechanics of Knee joint
 3. Define and explain lever system with suitable examples from human body
- II. Short answer Questions: $7 \times 5 = 35$
1. Explain parallel and concurrent force system.
 2. Draw a labelled diagram and explain load deformation curve for connective tissue.
 3. Biomechanics of Intervertebral Disc
 4. Trabecular System of Hip
 5. Mechanical Advantage
 6. Buckling
 7. Gait Cycle
- III. Very short answer questions $5 \times 3 = 15$
1. Lami's theorem
 2. Arches of Foot
 3. Osteo and arthro kinematics
 4. Cadence
 5. Calcaneal gait

FIRST YEAR BPO EXAMINATIONS
(Model Question)
BASIC ELECTRONICS
Time: 3hrs
Max marks: 80
•Answer all questions
•Draw diagrams wherever necessary

II. Essays: (2x15=30)

1. Define DC Circuits explain Transducers for Temperature, Light, Pressure and Sound. (15marks)
2. Electrical Safety and Safety Procedure for servicing equipment. (15marks)

II. Short essays:

(7x5=35)

3. Find the value of Current if the voltage is 20V and Two Resistances 5 ohms and 10 ohms are connected in parallel.
4. Working Principle of Transformer
5. Semiconductors.
6. Ideal Characteristics of Operational Amplifier
7. Advantages of Electronic Measuring Instruments.
8. Types of Electrodes
9. How does a prosthetic robotic arm work?

III. Brief notes:

(5X3=15)

6. Potential Difference.
7. RMS Value
8. Resistors
9. Transformer
10. Amplifier

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**FIRST YEAR BPO EXAMINATIONS
(Model Question)
PROSTHETIC SCIENCE I
Time: 3hrs
Max marks: 80
•Answer all questions
•Draw diagrams wherever necessary**

I. Essays: (2x15=30)

1. Describe the measurement and casting procedures of the PTBSC socket for a transtibial stump. (15marks)
2. Describe the Rectification (modification) procedures of end bearing Syme's socket. (15marks)

II. Short essays: (7x5=35)

3. Explain Medial thrust gait deviation
4. Describe excessive knee flexion gait deviation.
5. Explain the bench alignment of Syme's prosthesis with a neat diagram.
6. Describe the bench alignment of the Transtibial prosthesis.
7. List the tolerant and sensitive areas of non-end weight-bearing Syme's stump.
8. Write the checkout procedure of Transtibial prosthesis
9. Tabulate the different partial foot amputation levels with prosthetic management

III. Brief notes: (5X3=15)

1. List the types and designs of the transtibial socket.
2. List the advantages of soft liner in prosthesis
3. List the advantages of soft liner in prosthesis Transformer
4. Mention the trim lines and indications of the PTBSC socket.
5. Define push-fit/ hidden panel socket in Syme's Prosthesis

FIRST YEAR BPO EXAMINATIONS

(Model Question)

ORTHOTIC SCIENCE I

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays: (2x15=30)

1. Explain the Biomechanics of Solid AFO comparison with normal gait with a diagram.(15 Marks)

2. Discuss the fabrication procedure (Assessment, Measurement, bony landmarks and casting procedure) of posterior Leaf spring AFO. (15 Marks)

II Short Essays:

7X5=35

1. Discuss the Indication, function and trimline of Free motion Ankle foot orthosis with a neat diagram
2. What is the primary deformity of CTEV? Explain the various shoe modification with a neat sketch?
3. Discuss the orthotic management and objective of shoe modification in the case of pes planus and Hallux rigidus.
4. What are the indication and functions of Solid and Plantar flexion stop ankle foot orthosis?
5. Discuss the checkout process of Plastic Ankle foot Orthosis.
6. Discuss the landmarks, measurement and casting procedure of Supramalleolar orthosis (SMO)
7. What is foot drop? List out the gait observe in case of foot drop.

III. Brief notes:

(5X3=15)

1. Mention the Indication and function of rigid and flexible materials.
2. What is an abnormal gait? Write the reason for abnormal gait?
3. What are the different indications and functions of Rocker sole and Metatarsal bar?
4. What are the indication and functions of the Medial and lateral heel and sole wedge?
5. Mention the indication and function of Floor reaction ankle foot orthosis

SECOND YEAR BPO EXAMINATIONS

(Model Question)

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

PATHOLOGY

I. Essays: (2x15=30)

1. Define immunologic tolerance. Write in detail about central tolerance and peripheral tolerance.
2. Deformities of hand in Rheumatoid Arthritis and its orthotic management.

II. Short Essays:

(7x5=35)

1. Healing by secondary intention.

2. Edema.
3. Stages of Shock.
4. Deep vein thrombosis.
5. Angiogenesis.
6. Osteoarthritis.
7. Becker's Muscular dystrophy.

III. Brief notes:

(5X3=15)

1. Histamine and its role in Acute inflammation.
2. Types of Granulomas.
3. Liquefactive Necrosis.
4. Epithelioid cells.
5. Blood Grouping and Rh typing.

SECOND YEAR BPO EXAMINATIONS

(Model Question)

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

ORTHOPAEDICS, AMPUTATION SURGERY AND IMAGING SCIENCE

I. Essays: (2x15=30)

1. What is Fracture? What are the common causes of Fracture? Explain about principles of Fracture management.
2. What is Osteoporosis? Explain the causes and management of Osteoporosis.

II. Short Essays:

(7x5=35)

- a. What is Osteoarthritis? Explain management of Knee Osteoarthritis.
- b. What is Genu recurvatum? Write its causes and management.
- c. Write about the causes and treatment of Torticollis.
- d. What is Volkmann's Contracture? List its causes and Orthotic management.
- e. List common sports injuries and how they occur?
- f. Write about Skin infection in residual limb and its management.
- g. Explain how MRI is used as a diagnostic tool.

III. Brief notes:

(5X3=15)

1. What is Bursitis? How can it be treated?
2. Galeazzi fracture.
3. Podiatry.
4. What are the causes of metabolic diseases?
5. Ischemic limb.

SECOND YEAR BPO EXAMINATIONS

(Model Question)

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

COMMUNITY REHABILITATION & DISABILITY PREVENTION

I. Essays: (2x15=30)

1. What are the various causes of disabilities in India? Suggest measures to prevent them.
2. Describe Home Based and Centre Based Models of Early Intervention.

II. Short Essays:

(7x5=35)

1. What are the different methods of pressure mapping in foot?
2. Describe preoperative evaluation and rehabilitation management of a patient of peripheral vascular disease due for Below Knee amputation.
3. Describe the physiological effects of lumbar traction.
4. Describe the principles of prevention of Post Polio Residual Paralysis (PPRP).
5. Describe with suitable examples, Prevention of Disability.
6. Describe Transfemoral Stump bandaging techniques.
7. Clarify the concept of early intervention. Discuss the role of Orthotist in the process of early intervention.

III. Brief notes:

(5X3=15)

1. Define Meningo-myelocle.

2. What are communication disorders in children?
3. Enumerate common muscular dystrophies.
4. What is therapeutic exercise?
5. Muscle Tone.

SECOND YEAR BPO EXAMINATIONS

(Model Question)

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

BIOMECHANICS - II

I. Essays: (2x15=30)

1. Explain about gait cycle and gait parameters.
2. Explain about biomechanics of knee orthosis for osteoarthritis knee joint.

II. Short Essays:

(7x5=35)

1. TT gait deviations.
2. Biomechanics of quadrilateral socket.
3. Explain about different types of crutch gait.
4. Biomechanical principle of correcting genu varum and valgum.
5. Explain about closed and open kinematic chain.
6. Biomechanics of safety knee joint.
7. Explain about biomechanical forces on AFO by altering trim lines.

III. Brief notes:

(5X3=15)

1. Define gait and pathological gait.
2. Advantage of pyramid alignment system.
3. Four point pressure system.
4. Biomechanical Forces of FRO.
5. Bony lock in IC socket.

SECOND YEAR BPO EXAMINATIONS

(Model Question)

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

PSYCHOLOGY & SOCIOLOGY

I. Essays: (2x15=30)

1. Explain in detail about the role of the family in the treatment of a child with disability.
2. Explain about the creation of a barrier free environment to improve access for those living with disabilities.

II. Short Essays:

(7x5=35)

1. How do Non-Governmental Organizations help in providing Prostheses and Orthoses in Remote Villages?
2. Village is a Community. Explain.
3. What are the common social problems for person with disability? How can they be overcome?
4. Write about the Psychological aspects of disability.
5. Explain the functions of Social Organizations.
6. Is community based or hospital based Rehabilitation better? Explain.
7. How is the Healthcare situation in low income countries?

III. Brief notes:

(5X3=15)

1. Psychological illness in children.
2. Explain the cause of behaviour.
3. Should usage of local resources in healthcare be encouraged? Why?
4. Write about psychological development.
5. How can you promote independent living of a disabled person?

SECOND YEAR BPO EXAMINATIONS

(Model Question)

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

PROSTHETICS SCIENCE - II

I. Essays: (2x15=30)

1. Check out procedures for through Knee Prosthesis.
2. Explain about Quadrilateral Socket.

II. Short Essays:

(7x5=35)

1. Compare swing phase control knee joints and stance phase control Knee joints.
2. Total Contact Socket and its advantages.
3. Trans Femoral prosthesis Static alignment.
4. Casting and Measurement procedure for Knee disarticulation.
5. Alignment Procedure for Through Knee Prosthesis.
6. Gait deviation of through Knee Prosthesis user.
7. CAT-CAM socket.

III. Brief notes:

(5X3=15)

1. TES Belt.
2. Lateral Trunk Bending.
3. Endoskeletal and Exoskeletal prosthesis.
4. Ischial containment socket Trimlines.
5. MAS Socket.

SECOND YEAR BPO EXAMINATIONS

(Model Question)

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

ORTHOTICS SCIENCE - II

I. Essays: (2x15=30)

1. Gait analysis and check out procedures of KAFO.
2. Different types of Knee Orthosis with its Indication, Contraindication, Advantage & Disadvantage

II. Short Essays:

(7x5=35)

1. Toronto hip orthosis.
2. Para podium Vs Standing frame orthosis.
3. Floor reaction orthosis with bio mechanical principle.
4. Lower Limb weight relieving orthosis.
5. Knee orthosis for Osteo arthritis condition.
6. Genu valgum and its orthotic management Tools required for alignment of KAFO.
7. Tools required for alignment of KAFO.

III. Brief notes:

(5X3=15)

1. What is Craig Scott KAFO?
2. Explain about CDH.
3. Draw the force system in FRO.
4. What is PTB orthosis and its indication.
5. How you accommodate leg length discrepancy.

SECOND YEAR BPO EXAMINATIONS

(Model Question)

PHARMACOLOGY

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

1. Essays: (2x15=30)

1. Write about the different routes of administration of drugs. Mention the advantages and disadvantages.
2. Write about sedative and hypnotic drugs commonly used and their uses.

II. Short Essays:

(7x5=35)

1. What are the factors modifying drug response?
2. What are the adverse effects of corticosteroids?
3. What are non steroidal anti inflammatory drugs?
4. Role of insulin in treatment of diabetes.
5. Why are inhalers used in treatment of lung disorders?
6. What is Spasticity? How can it be reduced with medications?
7. Write about the classification of drugs.

III. Brief notes:

(5X3=15)

1. Write about the uses of morphine and when it can be used?
2. What are antiepileptic drugs?

3. Write about Pharmacokinetics.
4. Explain about Oral anti diabetic drugs.
5. Role of Immuno suppressants.

THIRD YEAR BPO EXAMINATIONS
(Model Question)
COMPUTER SCIENCE & GRAPHICAL COMMUNICATION

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays: (2x15=30)

1. What are the different types of Computers? Explain each one in Briefly.(15marks)
2. List out the function keys are used in Auto CAD from F1 to F12 and write down their commands.

I. Short essay:

(7x5=35)

1. Define Virus and its types.
2. What is CPU? Write down its functions.
3. Define Automation and its application.
4. Write down the difference between Primary and Secondary memory.
5. What is topology? What is its type?
6. Explain Internet and its uses.
7. How many types of printers are Available?

II. Brief notes:

(5x3=15)

1. Define Networking.
2. List different generation of Computer.
3. Advantages of CNC Machines.
4. Write Application of Spread sheet.
5. List few Input and Output devices.

THIRD YEAR BPO EXAMINATIONS
(Model Question)
BIOMECHANICS III

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays :(2x15=30)

3. Discuss the biomechanical principles of spinal braces with suitable examples.
4. Discuss the biomechanics of Boston brace in order to correct scoliosis for single curve.

II. Short Essays:

(7x5=35)

1. Shear force & bending moment diagrams
2. Discuss how low back pain reduces at LS spine through LS brace
3. Functional spinal unit
4. Open and closed helical spring
5. Myoelectric control system used in P& O devices
6. What is Euler's theory of buckling?
7. Anterior spinal hyperextension braces

III. Brief notes:

(5X3=15)

11. Fluid mechanics
12. Follower load
13. Stress concentration
14. Four point force system
15. Function of IV disc

THIRD YEAR BPO EXAMINATIONS

(Model Question)

ASSISTIVE TECHNOLOGY

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays: (2x15=30)

5. With neat diagram mention the various parts and functions of a standard wheel chair (adult size). Mention its specification.
6. Write, in details, the various types of crutches prescribed for various clinical conditions. Write down how the crutch measurement is taken.

II. Short Essays:

(7x5=35)

8. Tricycle & its use
9. Sports wheel chair
10. David Hart Walker
11. Parapodium
12. JACO arm
13. Wheel chair modifications for paraplegics
14. Pressure sore management techniques

III. Brief notes:

(5X3=15)

16. Seat cushion
17. Feeder
18. Blind cane
19. Tripod crutch gait
20. Rollators

THIRD YEAR BPO EXAMINATIONS

(Model Question)

RESEARCH METHODOLOGY AND BIostatISTICS

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays :(2x15=30)

1. What is sampling? Write down the types of sampling? What are the procedures involved in random sampling?
2. Elaborate the different types of research approaches.

II. Short Essays:

(7x5=35)

1. What is research? Write the significance of research
2. Find two regression equation, & estimate x, when y =65 & estimate y, when x =40

x	12	18	22	25	35	45	55	70	62	22
y	19	22	25	60	70	15	18	20	22	18

3. Find the mean, median ,mode

Mid value	5	15	25	35	45	55	65	75	85
frequency	10	12	18	20	25	11	9	8	6

4. Write the basic difference between primary & secondary data

5. Explain the role of hypothesis in research

6. Explain the application of statistics in research

7. List out the features of a good research design

III. Brief notes:

(5X3=15)

1. Bar diagrams & Pie diagrams
2. Exclusive & inclusive method of classification of data
3. ANCOVA
4. Cumulative frequency curves
5. Karl Pearson's correlation coefficient

THIRD YEAR BPO EXAMINATIONS

(Model Question)

PROSTHETICS SCIENCE

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

सर्वे भवन्तु सुखिनः

I.Essay:(2x15=30)

1. Discuss the different types of Harness system used for transradial prosthesis with suitable diagrams.
2. Define the concept of “ Myo-electric Prosthesis” .write the function of various elements of Myo-electric prosthesis.

II. Short Essays:

(7x5=35)

3. Difference between internal and external elbow unit
4. Sports & recreation prosthesis for U/E

5. Functional hand vs. cosmetic hand
6. Utah Dynamic socket
7. Shoulder prosthesis with basic shoulder harness
8. Muenster socket
9. Mechanism of transhumeral control system

III. Brief notes:

(5X3=15)

1. Quick change wrist unit
2. Step up hinges
3. Bowden control cable
4. Tricep pad
5. Excursion amplifier

THIRD YEAR BPO EXAMINATIONS

(Model Question)

ORTHOTICS SCIENCE

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

I. Essays: (2x15=30)

1. Discuss the biomechanical principle of finger splints with suitable diagram.
2. Explain the deformities in rheumatoid arthritis and its orthotic management.

II. Short Essays:

(7x5=35)

3. Wilmer carrying orthosis
4. Static splint vs. Dynamic splint
5. Thumb post vs. C bar
6. External power operated orthosis
7. Wrist driven flexor hinge splint
8. MAS
9. Elbow orthosis for burn injury

III. Brief notes:

(5X3=15)

1. Knuckle bender splint
2. Aeroplane splint
3. Splint for VIC
4. Shoulder sling
5. Cock- up splint

THIRD YEAR BPO EXAMINATIONS

(Model Question)

ORTHOTICS SCIENCE- IV

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

1. Essays:

(2x15=30)

1. Describe the prosthetic management of hip disarticulation amputee with neat diagram.
2. Write down the prosthetic management of PFFD.

2. Short Essays:

(7x5=35)

1. Briefly explain prosthetic management of congenital upper limb amputee.
2. Brief note on prosthetic management of bilateral shoulder disarticulation.
3. Brief note on prosthetic management of knee disarticulation amputee.
4. Write a note non osseo-integration.
5. Write a note on C-leg.
6. Write a note on TSB socket.
7. Write a note on C- walk foot.

3. Brief notes:

(5X3=15)

1. Figure-8 harness
2. VASS system
3. NSNA alignment
4. ISNY socket
5. Mulley strap

THIRD YEAR BPO EXAMINATIONS

(Model Question)

ORTHOTICS SCIENCE- IV

Time: 3hrs

Max marks: 80

•Answer all questions

•Draw diagrams wherever necessary

- 1. Essays:** (2x15=30)
1. What is Scoliosis? Explain how Boston brace control and correct the scoliotic spine?
 2. Describe different types of cervical orthosis?
- 2. Short Essays:** (7x5=35)
1. How to measure cobb's angle?
 2. Milwaukee brace parts and function?
 3. Spinal orthoses checkout procedure
 4. Explain about jewett TLSO brace
 5. Write down biomechanics of cow-horn brace
 6. Write down the fabrication procedure of semi-rigid cervical collar.
 7. Write down the evaluation, assessment and measurement procedure of LS brace.
- 3. Brief notes:** (5X3=15)
1. LSVT principle in spinal orthoses
 2. HALO Brace
 3. Creep and stress relaxation
 4. Jewett brace
 5. Spinecor brace

FOURTH YEAR BPO EXAMINATIONS

(Model Question)

MANAGEMENT & ADMINISTRATION

Time: 3hrs

Max marks: 80

***Answer all questions**

***Draw diagrams wherever necessary**

1. Essays: (2×15=30)

1. What is plant lay-out? Establish a plant lay-out for fitment and fabrication of prosthesis and orthosis.
2. What HRM? Explain what are the methods and techniques of HRM.

2. Short Essays: (7×5=35)

1. Difference between management and administration
2. Stores' management
3. Purchasing procedure
4. Safety measures
5. Nature and characteristics of a manager
6. Objectives, types and components of employee compensation.
7. Explain wage policy and methods of wage payment in India.

3. Brief notes: (5×3=15)

1. Bin card
2. Indent on store
3. Material return note
4. Store ledger
5. Skill/knowledge of management

सर्वे भवन्तु सुखिनः

FOURTH YEAR BPO EXAMINATIONS

(Model Question)

PROSTHETICS CLINICAL PRACTICE

Time: 3hrs

Max marks: 80

Answer all questions
Draw diagrams wherever necessary

I. Essays: (2×15=30)

1. Write down prosthetic management of B/L lower limb amputee (Rt. Short AK, lt. hip disart.)
2. Write down prostheses for sports activities.

II. Short Essays: (7×5=35)

1. IPOP and definitive prosthesis
2. Body powered and external powered prostheses
3. Rigid hinges
4. CBR and role of prosthetist in CBR
5. Bent knee prosthesis and its indication of prescription with diagram
6. Important considerations for prosthetic management of pediatric amputee
7. What is hybrid prosthesis? Describe its control mechanism in bilateral U/E amputee.

III. Brief notes: (5×3=15)

1. ISO classification of congenital limb deficiencies
2. Internal lock elbow unit
3. Partial hand prosthesis
4. ESR foot
5. Ethical role for clinical P&O

FOURTH YEAR BPO EXAMINATIONS
(Model Question)
ORTHOTICS CLINICAL PRACTICE

Time: 3hrs

Max marks: 80

Answer all questions

Draw diagrams wherever necessary

I. Essays: (2x15=30)

1. Mrs. Anju of age 53 years complains pain and lateral bending of both the Knees due to OA since last six months has reported in your clinic for Treatment. Write down the complete assessment, evaluation & prescription criteria to her.
2. What is CROW? Describe its stepwise fabrication procedure.

II. Short Essays: (7x5=35)

1. Orthotic management of CP according to gait pattern.
2. Write down post-operative orthotic management of elbow injury.
3. Different orthotic management of L3 spinal cord injury.
4. Role of soft foot insoles and shoe in anesthetic foot.
5. Risk factors in diabetic foot.
6. Orthotic clinic team procedure.
7. Components of orthotic prescription pad

III. Brief notes: (5X3=15)

1. Explain the different ethical considerations in establishing an orthotic clinic in India
2. TCC fabrication procedure
3. Mention two different government schemes for subsidized rehabilitation aids and appliances to PWDS and senior citizens.
4. Role of an Orthotist in a rehabilitation team.
5. VAS and its use in orthotic goal setting.
