

**MASTER OF  
PROSTHETICS AND ORTHOTICS  
(MPO)**

# **Syllabus**

*Norms, Regulations & Course Content*



**REHABILITATION COUNCIL OF INDIA**

*(Statutory Body Under Ministry of Social Justice & Empowerment)*

**B-22, Qutab Institutional Area**

**New Delhi – 110 016**

**2014**

**[www.rehabcouncil.nic.in](http://www.rehabcouncil.nic.in)**

## **RULES REGULATIONS AND NORMS FOR MPO**

**1.0 Nomenclature:** Master of Prosthetics & orthotics (MPO)

**2.0 Admission criteria:** BPO/ B. Sc (P&O) degree or equivalent from any recognized University in India with minimum 50 % marks. Relaxation of marks as per the instruction of respective Govt.

**3.0 Medium of instruction:** English

**4.0 Duration of the course:** Two academic years

**5.0 Course work:** Student to pursue the course as given in the enclosed course curriculum

**6.0 Award of Degree:** The respective University on successful completion of the requirements will award the degree.

**7.0 Criteria of passing:** As per university rules.

**8.0 Attendance:** Each year shall be taken as a unit for purpose of calculating attendance and a student shall be considered to have put in required attendance for the year, if he/she has attended not less than 80% of the number of working periods (lectures, seminars) and 90% of clinics during each year. Failure to put in / meet the required attendance by any student render him / her disqualified to appear in the university examination. The candidate who will not be able to take the examination for want of attendance will be declared as Failed and will have to repeat the exam subsequently by putting in required attendance. Shortage of attendance can be condoned in genuine cases of absenteeism as per rules and guidelines of respective universities.

**9.0 Appearance for the Examination:** A candidate shall apply for all papers of a year when he/she appears for the examination of that year for the first time.

**10.0 Scheme of Examination:** As per University rules.

### **11.0 Dissertation**

In the 2<sup>nd</sup> year, student will work on a selected topic of dissertation prepared under supervision and guidance of recognized faculty and will submit the same at the end of the year. This shall be assessed by one internal and one external examiners for 100 marks in which event the average of marks assigned by both the examiner shall be awarded to the candidate or it shall be assessed as accepted or as rejected with no marks carried there of as per concerned University norms. In the event of discrepancy between internal & external examiners the dissertation will be referred to a third examiner and his / her verdict on the same will be taken as final.

The candidates shall submit four copies of dissertation before the commencement of the theory examination of that year. Candidates who fail to submit their dissertation on or before the stipulated date shall not be permitted to appear for the final year examination.

## **12.0 Scheme of Instruction:**

12.1 There shall be a University examination at the end of each year. The duration of the theory exam is 3 hours.

12.2 Every theory question paper shall ordinarily consist of five questions with one question for each unit, subject to the concerned universities regulation.

12.3 In case of theory papers the continuous evaluation (IA) will be for 20 marks. This covers a maximum of 5 marks for attendance & 15 marks for tests, seminars, assignments etc or as per University norms.

12.4 For clinical practicum, continuous evaluation (IA) will be based on performance of the candidate during the year. Examination for clinical practicum will be held along with theory papers by the university.

12.5 The concerned department shall notify in the first week of each year, scheme of continuous evaluation (IA) for theory & practical or as per University norms.

12.6 At least one week prior to the last working day, continuous evaluation (IA) marks secured by the candidates shall be displayed on the notice board.

12.7 In case of repeat test/seminar to candidates who absented themselves, matter may be dealt as per University norms.

12.8 The statement of continuous evaluation (IA) shall be sent to the Registrar (Evaluation) for both theory and clinical practicum at least one week prior to the commencement of the particular year examination.

12.9 At the end of 1<sup>st</sup> and 2<sup>nd</sup> years internal viva voce exam will be carried out for award of internal assessment for clinical work performed throughout the year.

## **13.0 Board of Examiners, Valuation:**

13.1 There shall be a Board of Examiners for scrutinizing and approving the question papers and scheme of valuation or as per University rules.

13.2 About 50% of the examiners for scrutinizing and approving the question papers and scheme of valuation shall be from outside the institution/university or as per University rules.

13.3 Double valuation for the theory; dissertation and the average of the marks awarded by the internal and external examiners shall be taken as the final award or as per University rules.

13.4 In case of 20% or more deviation in the marks awarded by the internal and the external valuer, the scripts shall be referred to the third valuer and his evaluation will be final or as per University rules.

13.5 Grace marks to the candidate will be awarded based on University rules.

## **14.0 Classification of Successful Candidates**

14.1 Minimum for a pass in each paper shall be as per the concerned university regulations.

14.2 Grading:

Grading:

≥ 40 < 50% Pass Class

≥ 50 < 60% Second Class

≥ 60 < 75% First Class

75% and above Distinction

OR

As per rules of the respective universities.

14.2 Announcement of result, classes and ranks for the course as a whole will be as per the concerned university regulations.

### 15.0 Provision for Repeaters

The provision will be as per the concerned university regulations.

### 16.0 Miscellaneous

Any other issue not envisaged above shall be resolved by RCI / the Vice Chancellor in consultation with the appropriate body of the University which shall be final and binding.

### 17.0 Norms for Minimum Infrastructural Facilities

Sl No	Designation	Qualification		Experience	Publications
		Essential	Desirable	Essential	
1	Professor	Ph.D. /MPO In the Field of Prosthetics & orthotics		10 years teaching experience in the field	Essential
2	Reader/ Associate Professor	MPO	Ph.D. In the Field of Prosthetics & orthotics	5 years of teaching/ research experience with graduate / post graduate courses	Essential
3	Assistant Professor/ Lecturer	MPO		2 years teaching / research experience	
4	Senior Prosthetist & Orthotist (Clinical Supervisor)	MPO	Prosthetist & Orthotist		
5	Prosthetist & Orthotist (Clinical Instructor)	BPO	MPO		

#### Note:

1. Minimum of 2 faculty members in core areas will be required for giving recognition for the first year.
2. Before the commencement of second academic year one more Faculty member must be appointed.
3. In case of Professor not being available, 2 Readers are appointed to accommodate teaching, research guidance and administrative work.
4. 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.

Sl No	Designation	Qualification		Experience	Publications
		Essential	Desirable	Essential	
1	Professor (1)	Ph.D. /MPO In the Field of Prosthetics & orthotics		10 years teaching experience in the field	Essential
2	Reader/ Associate Professor (1)	MPO	Ph.D. In the Field of Prosthetics & orthotics	5 years of teaching/ research experience with graduate / post graduate courses	Essential
3	Lecturer/ Assistant Professor (2)	MPO		2 years teaching / research experience	
4	Senior Prosthetist & Orthotist (Clinical Supervisor) (2)	MPO	Prosthetist & orthotist		
5	Prosthetist & orthotist (Clinical Instructor) (2)	BPO	MPO		

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

### 18.2. Library Facilities:

Library should accommodate at least, 30% of the institution's students and staff total strength. Library should have internet and photocopying facilities.

a) **Reading room:** Two reading rooms should be there

(i) Reference room with Internet provisions

(ii) General Reading room

b) **No. of books:** Books listed for each paper under "essential" should be available.

c) **No. of Journals:** There should be at least 8 most essential journals.

d) **Staff:**

(i) Library and Information Officer – One No.

Qualifications: B.Lib with two years of experience in handling technical library using Information Technology.

(ii) Library Assistants: One

Qualifications: SSLC + Diploma in Library Sciences or SSLC +  
JOC in Library Sciences.

All the facilities may be increased to meet the requirements in a phased manner.

**18.3. Audiovisual Instruments:** Appropriate Number of Audio-visual material should be provided as prescribed.

**18.4. Space:**

Sr. No.		Size (Sq. Ft.)	Graduate	Graduate and PG
a)	Class Rooms	Size should be adequate to accommodate (9 sq. ft. per student)	Half the No. of total batches/ course (Min. 2 class room)	Half the No. of total batches/ course (Additional 1 room for each PG course)
b)	Room for reception where patients are registered.			
c)	Room for Assessment, training and Counseling	(6 x 6)	5 for 20 intake and	With one PG course 12
	Principal's Office room			
	Sanitary facilities			
	Hostels for Men and Women to accommodate at least 50% of the student population.			
	Administrative staff room.			

**18.5. Equipment (Minimum Requirement):**

Sr. No.		Graduate	Graduate and PG
1	Hot Air Oven Heating chamber size-(36"W x 24"D x 30"H), with double layer toughened Front visible glass with inside light arrangement, Maximum temperature 350 Degree C. 12 KW Rating and 1HP 3 phase Ruchi Motor for fan with Digital timer with Hooter with digital thermostat temperature Controller.	02 No.	03No.
2	Polisher converted to Cone sanding machine 2 HP 3 phase motor	02 No.	03No.
3	Bench Grinder 0.5 HP, single phase motor, Abrasive Wheel size 10 inch x1 inch □	02 No.	03No.
4	Drilling Machine (Pillar) Drilling capacity 25 mm, Pillar dia. 87 mm Maximum distance spindle to table 600 mm, Table working surface dia. 400 mm with 1 HP 3 phase motor	02 No.	03No.
5	Bench Drilling Machine with stand, Capacity ½ inch	02 No.	03No.
6	Shearing machine gear type Cutting blade length 14 inch	02Nos.	03Nos.
7	Industrial Sewing Machine with ¼ HP motor	04Nos.	06Nos.

8	Adjustable Circular Saw dia.18", Working table size 24"x36" Maximum depth of cut 5½" with 3 HP motor 3 phase	02Nos.	03Nos.
9	Belt and Disc Sander Disc dia. 10 inches, belt size 6"x48" with 1 HP 3 phase motor	02Nos.	03Nos.
10	Electronic Weighing machine	01No.	02Nos.
11	Hot Air Gun Temperature range 100-600 degrees C, Power input 2000W	04Nos.	06Nos.
12	Jig Saw Machine sawing depth in wood 54 mm, rated input 350 W	06Nos.	09 Nos.
13	Suction machine/ Vacuum Pump	01No.	02Nos.
14	Router Machine (adjustable / static) with accessories	01No.	02Nos.
15	Hand Drill machine (Cordless)	02 Nos.	03Nos.
16	Computers	10Nos.	15Nos.
17	LCD Projectors	02 Nos.	03Nos.
18	Laptop	01 No.	02Nos.
19	Tussle board for drawing (01 for each student)	02 Nos.	03Nos.
20	Lathe Machine	02 Nos.	03Nos.
21	Band saw machine Cutting table surface 20"x 21" Wheel dia-18 inch, blade width 1" Maximum height 50"	02 Nos.	03Nos.
22	Bench Grinder-cum-Sander 0.75 HP 1 phase	02 Nos.	03Nos.
23	Disc saw machine 0.5 HP I phase motor	02 Nos.	03Nos.
24	Hot Water oven for low temperature thermoplastic sheet	02 Nos.	03Nos.
25	Belt and Disc sander Disc dia. 10 inches belt size 6x48 inches with 0.5 HP	02 Nos.	03Nos.
26	Work stations ( 2 work benches) with 2 inches wooden table top	5 Nos.	7Nos.

**Course Content:****MPO-1<sup>st</sup> Year**

<b>Code no.</b>	<b>Paper Title</b>	<b>Theory/ Practical Hrs/wk</b>	<b>(Theory+ IA)</b>	<b>Total</b>
PO101	Applied Biomechanics & Kinesiology	03 Hrs	80 + 20	100
PO102	Clinical Gait Analysis	03 Hrs	80 + 20	100
PO103	Advance Lower Extremity Orthotics	03 Hrs	80 + 20	100
PO104	Advance Materials in P&O	03 Hrs	80 + 20	100
PO105	Advanced Lower Extremity Prosthetics	03 Hrs	80 + 20	100
PO106	Research Methodology & Biostatistics	03 Hrs	80 + 20	100
PO107	Biomechatronics	03 Hrs	80 + 20	100
PO108	Clinical Practicum (Prosthetics)	15 Hrs	- + 100	200
PO109	Clinical Practicum (Orthotics)		- + 100	
PO110	Clinical Practicum Examination (Annual Examination)	50 + 50		100
	Grand TOTAL			1000

**MPO-2<sup>nd</sup> Year**

<b>Code no.</b>	<b>Paper Title</b>	<b>Theory Hrs/wk</b>	<b>(Theory+ IA)</b>	<b>Total</b>
PO201	Pedagogy in P&O Education	03 Hrs	80 + 20	100
PO202	Administration, Management & Ethical Issues	03 Hrs	80 + 20	100
PO203	Advanced Upper Extremity Prosthetics	03 Hrs	80 + 20	100
PO204	Advanced Upper Extremity Orthotics	03 Hrs	80 + 20	100
PO205	Spinal Orthotics	03 Hrs	80 + 20	100
PO206	Assistive Technology	03 Hrs	80 + 20	100
PO207	Clinical Practicum (Prosthetics)	15 Hrs	- + 100	200
PO208	Clinical Practicum (Orthotics)		- + 100	
PO209	Clinical Practicum Examination (Annual Examination)	50 + 50		100
	Grand TOTAL			



## Course Content of MPO 1<sup>st</sup> Year

**PO 101**

**Applied Biomechanics & Kinesiology-**

**75 hours / 100 marks**

Unit-1

**a. General Biomechanics:**

Force & its component, Lever & mechanical Advantage, Torque or Moment of force & Ground reaction force & Introduction of Kinetics & Kinematics

**b. Tissue Biomechanics:**

Histology & nourishment of connective tissues, joint mechanics & consideration of positioning of joints & application of tissue biomechanics in P&O.

Unit-2

**a. Biomechanics of Ankle & foot complex**

Structure & function of the bones & noncontractile element of the ankle & foot complex, mechanics & pathomechanics of muscle activity at the ankle & foot & analysis of the forces on the ankle & foot during activity.

**b. Biomechanics of knee**

Structure & function of the bones & noncontractile element of the knee, mechanics & pathomechanics of muscle activity at the knee & analysis of the forces on the knee during activity.

Unit-3

**a. Biomechanics of Hip**

Structure & function of the bones & noncontractile element of the Hip, mechanics & pathomechanics of muscle activity at the hip & analysis of the forces on the Hip during activity.

**b. Biomechanics of Spine:**

Structure & function of the bones & joints of the cervical spine, mechanics & pathomechanics of the cervical musculature, analysis of the forces on the cervical spine during activity, structure & function of the bones & joints of the thoracic spine, mechanics & pathomechanics of the thoracic musculature, analysis of the forces on the thoracic spine during activity & structure & function of the bones & joints of the lumbar spine.

c. Mechanics & pathomechanics of the lumbar musculature, analysis of the forces on the lumbar spine during activity, structure & function of the bones & joints of the pelvis, mechanics & pathomechanics of the muscle activity in the pelvis & analysis of the forces on the pelvis during activity.

## Unit-4

### **a. Biomechanics of Shoulder:**

Structure & function of the bones & joints of the Shoulder complex, mechanics & pathomechanics of the muscle activity in the Shoulder complex & analysis of the forces on the Shoulder complex during activity.

### **b. Biomechanics of Elbow:**

Structure & function of the bones & noncontractile element of the elbow, mechanics & pathomechanics of muscle activity at the elbow & analysis of the forces on the elbow during activity.

## Unit-5

### **a. Biomechanics of Wrist & Hand**

Structure & function of the bones & joints of the wrist & hand, mechanics & pathomechanics of the muscle activity in the wrist & hand, analysis of the forces on the wrist during activity, mechanics & pathomechanics of the Special connective tissue in the hand, mechanics & pathomechanics of the intrinsic muscles of the hand & mechanics & pathomechanics of the pinch & grasp.

### **d. Posture.**

Reference:

- 1 Synopsis of Surgical Anatomy
- 2 Gray's Anatomy-
- 3 Grants – Methods of Anatomy
- 4 Clinical Anatomy for Medical Students
- 5 Textbook of Medical Physiology
- 6 Pathologic Basis of Diseases
- 7 The Pharmacological basis of Therapeutics
- 8 Pathology implications for Physical Therapists
- 9 Hutchinsons – Clinical Methods of Medicine
- 10 Outline of Orthopedics
- 11 Outline of Fractures
- 12 Tureks – Orthopedics
- 13 Text Book of Radiology
- 14 The Pharmacological basis of Therapeutics
- 15 Pharmacology and Pharmacotherapeutics
- 16 Davidsons – Principles and Practice of Medicine
- 17 Systems of Orthopedics
- 18 Clinical Kinesiology
- 19 Kinesiology – Scientific Basis of Human Motion, Brown & Benchmark
  
- 20 Kinesiology and Applied Anatomy,
- 21 Biomechanics of Spine
- 22 Physiology of Joints
- 23 Clinical Neurophysiology.

24	The Biomechanics of Sports Techniques,
25	Biomechanics – A Qualitative approach for studying Human Motion
26	Joint Structure and Function - A Comprehensive Analysis -
27	Analysis of Sports Motion: Anatomic and Biomechanics perspectives
28	Basic Biomechanics in Sports and Orthopedic Therapy
29	Biomechanics of Sports
30	Muscle alive
31	Basic Biomechanics of Muscular Skeletal System
32	Introduction to Sports biomechanics

## **MP102 - Clinical Gait Analysis**

### **Objective**

#### **Unit-1**

- a. Normal gait, pathological Gait & Observational Gait Analysis
- b. 3D Kinetic & kinematic Analysis, motion analysis & force plate analysis

#### **Unit-2**

- a. Temporal & Spatial Gait Parameter, stride measurement system & energy Expenditure
- b. Measurement of Energy Expenditure, pathological gait with emphasis on polio, cerebral palsy, dystrophies, hemi paresis, Para paresis

#### **Unit-3**

- a. Running, stair climbing & changes in gait following various surgeries/ diseases/ disorders.
- b. Basic wheelchair skills and assessment training.

#### **Unit-4**

- a. Gait Analysis in partial foot amputation & prosthetics, Syme's amputation & prosthetics & Transtibial prosthetics
- b. Through knee prosthetics, Transfemoral prosthetics & Hemipelvectomy/ Hip Disarticulation prosthetics

#### **Unit-5**

- a. Gait analysis in AFO, KAFO, Bilateral involvement
- b. Gait Training

## **Reference:**

- Human Walking- Rose & Gamble
- Gait analysis- Perry J
- Gait analysis-Whitte
- Gait analysis- Craik
- Atlas of amputation and Limb deficiencies- Michael & Bowker
- Atlas of Orthoses and assistive devices.

## MP103 - Advance Lower Extremity Orthotics

### Objective

#### Unit-1

- a. Anatomy & kinesiology of lower extremity, Ergonomic principles in lower extremity orthotics, International Organization for Standardization (ISO) terminology,
- b. Evidence based approach to lower limb orthotics rehabilitation, Material and technologies used in lower limb orthotics, Biomechanical principles influencing orthosis & direct and indirect biomechanical effect

#### Unit-2

- a. **Evidence based management of** Metatarsalgia, Sesamoidities, Morton's syndrome, Morton's neuroma, Hallux rigidus, Hallux valgus, Hammer toes, Claw toes and Mallet toes, Pes planus, Pes equines, Pes cavus, Planter fasciitis, Arthrodesis, Achilles tendinitis.
- b. Functional foot orthosis, Assessment and evaluation of foot, Non weight bearing and weight bearing examination, Goal of orthotic intervention, Type of foot orthosis, Casting techniques, Material used in fabrication of foot orthosis, Component of foot orthosis, UCBL, SMO.
- c. Ankle foot orthosis, Prerequisites of functional gait, Rockers of gait, Biomechanical principle of ankle foot orthoses, Material and methods, Orthotic ankle joint & various ankle foot orthosis, Neurophysiological ankle foot orthosis, FRO & its Application.

#### Unit-3

- a. **Orthotic Management of Knee** -anatomy of knee joint, Biomechanics of knee motion, Classification, Biomechanical consideration, Knee orthosis & its application.
- b. Knee orthosis for osteoarthritis: Efficacy of knee orthoses, Effect of insoles, Orthoses for patellofemoral dysfunction & Orthotic knee joints & its Classification.
  - a. Knee ankle foot orthosis: Classification, Biomechanical consideration, Indication of knee ankle foot orthosis, Evaluation and prescription, Various Knee ankle foot orthosis design, Conventional Knee ankle foot orthosis, Thermoplastic Knee ankle foot orthosis.

#### Unit-4

- a. **Orthotic management of Hip**-anatomy of Hip joint, Biomechanics of Hip motion, Classification, Biomechanical consideration.
- b. Hip orthosis & its application, orthotic Hip joints & its Classification
  - b. Hip knee ankle orthosis: Classification, Biomechanical consideration, Indication of Hip knee ankle foot orthosis, Evaluation and prescription, Various Hip knee ankle foot orthosis design.

### 2. Orthotic management of the neuropathic and or dysvascular patient:

- a. Peripheral neuropathy, Causes of Peripheral neuropathy, Charcot neuropathy (Charcot joint), Assessment and examination, Toe deformities,

Complication of neuropathic foot, Examination of neuropathic foot, Venous static ulcers, Grading of ulcers, Management of foot ulcers, Orthotic treatment, Various type of orthotic devices , Various shoe modification, Peripheral vascular disease, Utility of pressure garment.

### **3. Orthosis for persons with neuromuscular disorders:**

3.1. Pathophysiology, Epidemiology, Pathological type, Current issue and research outcome, Treatment consideration, Assessment and evaluation, Non operative management and modalities, Orthotic consideration

### **4. Knee orthoses for sports related disorders:**

4.1. Various knee ligament injuries, various design consideration, Clinical relevance for orthotic management, Current researches, Epidemiological studies and Clinical performance of orthotic braces.

### **5. Orthoses in total hip and knee replacement:**

5.1. Historical background, Dislocation and classification, Pathophysiology of dislocation, Orthotic management of dislocation, Neurological complications, Orthotic consideration for treatment, Orthotic management after knee replacement.

### **6. Orthoses for person with post polio syndrome:**

6.1. Pathophysiology, Historical perspective, Current issues and research outcome, Treatment consideration, Orthotic management; Ankle foot orthosis, Knee ankle foot orthosis, Orthoses for person with post polio **sequelae**, Difference between post polio syndrome and post polio sequelae, Current issue and research finding, Treatment consideration, Assessment and examination, Various orthotic option, Effect of orthotic management, Biomechanical consideration during fitment of orthotic.

### **7. Orthosis for person with spinal cord injury:**

7.1. Pathophysiology, Level of injury, Various issues related to spinal cord injury, Treatment consideration, Various assessment and diagnostic tools, Operative management, Non-operative management, Importance of orthotic management.

### **8. Orthotic management for person with traumatic brain injury:**

9. Pathophysiology, Current issue and research finding, Abnormal walking pattern, Kinematic and kinetics analysis, Assessment and examination, Treatment consideration, Non operative management, Various Orthotic management

### **10. Pediatric Orthosis:**

13.1.1 Congenital and acquired disorders: Pathophysiology of disorder, Current issue and research finding, Assessment and evaluation tools, Type of deformity, Treatment consideration, Orthotic management modalities, biomechanical consideration of orthosis,

Type of disorders, Congenital foot deformities, Metatarsus adductus, Skew foot, Club foot, Congenital vertical talus, Calcaneovalgus foot, Flat foot, Cavus deformity, Kohler disorder, Bunion , Freiberg infraction, Bowleg, Knock knee, Tibia vara and valga

13.1.2 Pediatric hip orthoses: Pathophysiology of disorder, Current issue and research finding, Assessment and evaluation tools, Type of deformity, Treatment consideration, Orthotic management.

- a. Orthoses for muscle disease patient: Pathophysiology, Current issues and research outcome, Assessment and evaluation tools, Treatment modalities, Effect of team approach, Orthotic consideration.
- b. Orthoses for cerebral palsy: Pathophysiology, Biomechanical dysfunction, Effect of GRF, Direct and indirect control mechanism, Historical perspective, Current issues and research outcome, Assessment and evaluation tool, Orthotic Consideration.
- c. Orthoses for myelomeningocele: Pathophysiology, Historical perspective, Assessment and evaluation tool, Level of involvement, Current issues and research outcome, Orthotic Consideration.

Reference:

- AAOS Atlas of Orthoses and Assistive devices- Hsu, Micheal & Fisk
- Orthotics and Prosthetics in Rehabilitation- Lusardi & Nielsen
- Foot Orthosis, Principle and Clinical Application- Kent K .Wu
- Orthotics in Rehabilitation- McKee & Morgan
- Orthotics in functional Rehabilitation of the Lower Limb- Nawoczenski & Epler
- Prosthetics and Orthotics- Shurr & Michael
- Orthotics A Comprehensive Clinical Approach- Edelstein & Brucker
- The Functional Foot Orthosis- Philips

## PO 104 Paper - Advance Materials in P&O

### 1. Polymers

- 1.1. Classification, Condensation and addition polymers ,Degree of polymerization, Method of linking ,Mechanism of additional polymerization ,Copolymerization, Emulsion polymerization ,Thermoplastic polymers, Thermosetting and thermoplastic resins ,Methods of fabrication ,Compression moulding ,Injection moulding, Transfer moulding, Extrusion moulding, Castings, Plasticsols and plastigels, Foamed plastics, Rubber and elastomers, Compounding, Vulcanization accelerators, Fillers, Antioxidants, Colouring agents, Reinforcing agents, Plasticisers ,Elastomers, Rubber goods directly from latex ,Reclamation of rubber.
2. **SILICON** : Introduction, Nomenclature, Raw materials, Structure, Silicon resins ,Methods of preparation, Properties, Applications, Silicon fluids ,Properties , Applications
3. **Additives**: Different types of additives, their applications, properties and its uses.
4. **COMPOSITES**: Different types of composites Their applications, properties and its uses
5. **MATERIAL TESTING**: Hardness, Flexural, Structural strength, Mechanical strength.
6. Smart materials and its application in P & O.
7. Steel Alloys: Definition, Properties, heat treatment method, Applications.
8. Ceramics: Definition, Properties, Types, manufacturing Process, Application.
9. Non-Ferrous Metals.
  - a. Rubber
  - b. Adhesive
  - c. Plaster of paris
  - d. Fabrics
  - e. Wood
10. Application of advance materials in P &O

### Reference:

- Polymeric materials encyclopedia - Joseph C. Salamone
- A Textbook of Polymers (Processing and Application) – M S Bhatnagar
- Materials science and Engineering An Introduction- William D, Callister , Jr.
- Strength of Materials- Subramanian
- Engineering with Fiber-Polymer Laminates- Peter C. Powell
- Carbon Materials for Advanced Technologies- Timothy D Byrchell
- Physics of Plastics- Birley, Haworth and Batchelor
- Introduction to Polymers- R J young and P A Lovell



## **PO-105 Paper - Advanced Lower Extremity Prosthetics**

1. Prosthetic Foot:
  - 1.1.1. Advancement in the prosthetic foot, Energy expenditure of the amputee gait and comparison of different prosthetic feet, Biomechanics of prosthetic feet, Programming of microprocessor prosthetic foot,
2. Prosthetic Knee Joint :
  - 2.1.1. Advancement in prosthetic knee joint, Biomechanics of prosthetic knee joint, Criteria for prosthetic knee joint, Programming of microprocessor prosthetic knee joint, Biomechanics of hydraulic fluid, Biomechanics of MRF fluid.
3. Prosthetic Hip joint:
  - 3.1.1.1. Advancement in prosthetic Hip joint, Biomechanics of prosthetic Hip joint, Criteria for prosthetic Hip joint, Programming of microprocessor prosthetic Hip joint, Biomechanics of hydraulic fluid.
4. Partial Foot Amputation;
  - 4.1.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management Partial foot amputation.
5. Syme's Amputation:
  - 5.1.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management of Syme's Amputation.
6. Transtibial Amputation:
  - 6.1.1.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in Transtibial prosthetic management.
7. Through knee Disarticulation:
  - 7.1.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management of through knee disarticulation.
8. Transfemoral Amputation:
  - 8.1.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management Transfemoral amputation.
9. Hip Disarticulation & TransPelvic Amputation:
  - 9.1.1.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management of Hip Disarticulation & Transpelvic amputation.
10. Advancement in prosthetic management of translumbar amputation (hemipelvectomy).
11. Prosthetic and orthotic management of lower limb deficiency.

12. Emerging trends in lower limb prosthetics: research and development.
13. Fitting and training the bilateral lower limb amputee.
14. Prosthetic management of multiple limb deficient child
15. Vannes rotation plasty in tumour surgery.
16. Lower -Limb Prosthetic Adaptations for Sports and Recreation.
17. Osseo integration technique and its application

Reference:

- Atlas of amputation and Limb deficiencies- Michael & Bowker
- Orthotics and Prosthetics in Rehabilitation- Lusardi & Nielsen
- Prosthetics and Orthotics- Shurr & Michael
- Amputation and Prosthetics- Bella J May
- Prosthetics and Patient Management- Carroll & Edelstein
- Therapy for Amputee- Engstrom Van de Van

## **PO-106 Paper - Research Methodology & Biostatistics**

Objective:

1. To orient the student on the basics of statistics, and its application to the field of prosthetics and orthotics.
2. To enable the student to select and carry out appropriate statistical calculations as required for research in the field of prosthetics and orthotics.
3. To equip the students with necessary knowledge to be able to interpret the analyzed statistical related data to the field of prosthetics and orthotics.
4. To familiarize the students on the importance and applications of research methods and techniques applicable to the field of prosthetics and orthotics.

### **Section A**

#### **Research Methodology**

##### **Unit-1**

- a. Methods of research in behavioural sciences – research design – measuring purpose – principles – needs – applications between group designs and single subject research designs.
  - Basic of research – science scientific approach – problems – hypothesis – constructs – variables.
- b. Types of research- empirical rationale-experimental and export-factor research laboratory experiments - field studies – survey research - fundamental research epidemiology-clinical and applied research.

##### **Unit-2**

- a. Technique of sampling – sampling and randomness-principles of randomization – random assignment – methods – random sampling-stratified sampling, incidental sampling – purposive samples of one to tone matched sampling – size of sample.
- b. Measurement – foundations – types – reliability – validity.
  - Variance – implication to research – variance control.
  - Techniques of equation – experimental and control groups – matching and randomization – advantages, disadvantages and limitations.
- c. Research designs – various types of group designs – various types of single subject research designs.
  - Analysis and interpretation – principles, indices – cross breaks – factor analysis – multivariate statistics – time series analysis.
  - The research report – cardinal characteristics – purpose – structure presentation and writing style.

#### **d. Institutional guidelines to carryout research in P & O**

### **Section -B**

#### **Biostatistics**

##### **Unit-3**

- Statistics – purpose – approach – methods – measures of central tendency – Dependability of these measures – research applications.
- Measures of variability – types and meaning of various measures – research applications.
  - Standard score –normal distribution deviations – skewness and Kurtosis – conditions of applications – limitations in interpretation.

##### **Unit-4**

- a.Theory of probability – principles and properties of normal distribution – binominal distribution – interpretation of data using the normal probability curve – causes of distribution – deviations from the normal forms.
- b.Correlation – meaning – coefficient of correlation – linear correlation – product moment correlation – rank correlation, biserial correlation, tetracoric correlation partial and multiple correlations – regression equation.
- c.Variance – concept – foundations – assumptions – one way classification. ANOVA MANOVA, ANCOVA, MANCOVA.

### **Unit-5**

- a.Item analysis – item pool – its selection – item difficulty item variance – item conduction – time validity – difficulty index.
- b.Non – parametric statistics – its nature and condition and application – non parametric analysis of variance and measures of association – tests of difference with correlated and uncorrelated data – tests of similarity.
- c.Selection appropriate statistics methods in the research, receivers operating characteristics

## **Reference:**

- Research Methodology- Kothari, C.P
- Research Methodology: Kumar
- Research for physiotherapists
- Handbook of research Method
- Introduction to research in Health Sciences
- Methods in Biostatistics: For Medical students and research workers
- An Introduction to biostatistics

# **PO-107- Paper – Biomechatronics**

## **1. CAD-CAM**

- 1.1.1. Introduction to CAD
- 1.1.2. CAD application in Prosthetics and Orthotics
- 1.1.3. Graphical representation
- 1.1.4. Graphical representation of solid model
- 1.1.5. Geometric modeling
- 1.1.6. Solid modeling concept
- 1.1.7. Process of solid modeling
- 1.1.8. Geometric transformation
- 1.1.9. Vector and matrix algebra
- 1.1.10. Geometric transformation
- 1.1.11. Two dimensional transformation
- 1.1.12. Three dimensional transformation
- 1.1.13. Two and three dimensional transformation and projection
- 1.1.14. Projection
- 1.1.15. Prospective projection
- 1.1.16. Plane curve and cones
- 1.1.17. Cubes
- 1.1.18. Bezier curve
- 1.1.19. Solid modeling
- 1.1.20. Solid modeling concept
- 1.1.21. Half spaces, Boundary representation (B-rep)
- 1.1.22. Constructive solid geometry (CSG)
- 1.1.23. Other solid modeling schemes
- 1.1.24. Visibility concepts- Clipping
- 1.1.25. Visibility concepts- 3D Clipping
- 1.1.26. Visible lines and surface
- 1.1.27. MATLAB Tutorial

## **1.2. CAM**

- 1.2.1. Introduction of CAM
- 1.2.2. Classification of CNC and NC system
  - 1.2.2.1.1. Types of CNC machines
- 1.2.3. Purpose of CNC and NC system
- 1.2.4. Process of CNC
- 1.2.5. Advantage of CAM system
- 1.2.6. Application of CAD- CAM in P&O field
- 1.2.7. Advantage of CAD- CAM in P&O field
- 1.2.8. Latest development in application of CAD-CAM in P&O field

## **2. Electronics**

### **A. Introduction:**

D.C. Circuits, Ohm's Law, Kirchoff's Laws, D.C. Circuits, Nodal and Loop methods of analysis, A.C. CIRCUITS, Sinusoidal signal, Instantaneous and peak values, RMS and

average values, Behaviors of components in A.C. circuits, Series and parallel a.c. circuits, Series and parallel A.C. circuits, Series and parallel resonance ,Q factor, Cut-off frequencies and bandwidth, Magnetic circuit concepts: Self inductance ,Magnetic coupling analysis of single tuned & double tuned, Circuit involving mutual inductance.

**B.** Introduction to transformer: Circuit analysis, Sinusoidal steady state circuit analysis, Voltage, current, sinusoidal & phaser presentation single phase AC circuit ,Behavior of resistance, Inductance & capacitance & their combination, Impedance concept of power, Power factor, Series & parallel resonance ,Band width & quality factor, Measurement of R, L, and C,

**C.** Network theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Star to Delta & Delta to Star transformation.

Transformers: Principle, construction & working of transformer, Efficiency and regulation,

**D.** Application of electronic in Prosthetics and Orthotics field.

### **3.Robotics**

**3.1.Introduction:** types, classification and usage, Science and Technology of robot, Utility of robotics in field of Prosthetics and Orthotics,

**3.2. Elements of robots – links, joints, actuators, and sensors,** Purpose of sensors, internal and external sensors, common sensors, encoders, tachometers ,strain gauge based force-torque sensors, proximity and distance measuring sensors

**3.3.Kinematics of serial robots:** Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots

Reference:

- Introduction to Mechatronics and measurement system- David G Alciatore & Micheal B Hystad
- Introduction to Robotics: Mechanics and Control, 3/E. By John J. Craig, Prentice Hall.
- Principles of Robot Motion , by Choset et al.
- Robotics Toolbox for Matlab
- Robot Building for Beginners
- Industrial Robotics – Technology, Programming and Applications”, M.P.Groover, MC Graw Hill, 2001
- “Robotics Control, Sensing, Vision and Intelligence”,Fu.K.S.Gonzalez.R.C., and Lee C.S.G, ,McGraw-Hill Book Co., 1987
- “Robotics for Engineers”,Yoram Koren, McGraw-Hill Book Co., 1992
- “Robotics and Image Processing”, Janakiraman.P.A, Tata McGraw-Hill,1995
- Semiconductor Devices and Circuits- Alok K Dutta
- Engineer's Mini-Notebook: Formulas, Tables and Basic Circuits- Forrest M. Mims
- Advances in Solid State Circuit Technologies- Paul K Chu
- CAD\_CAM- Mc Mohan
- CAD-CAM- Cotticchia
- Easy Auto CAD for windows- Hood

## **PO 108 CLINICAL PRACTICUM- PROSTHOTICS(Lower Extremity)**

### **Objectives**

- 1. The student should be able to assess, diagnose, plan and execute for children and adults with various amputation (congenital and acquired).*
  - 2. To maintain clinical record.*
- 
- 1. Assessment of minimum 20 clients with various amputation (congenital and acquired) .*
  - 2. Use of instrumentation in minimum 10 clients with amputation (congenital and acquired).*
  - 3. Plan and execute in minimum 5 clients with amputation (congenital and acquired).*
  - 4. Maintain clinical records.*

## **SH 109 CLINICAL PRACTICUM- ORTHOTICS (Lower Extremity)**

### **Objectives**

- 1. The student should be able to assess, diagnose, plan and execute for children and adults with various amputation (congenital and acquired).*
  - 2. To maintain clinical record.*
- 
- 1. Assessment of minimum 20 clients with various disorders.*
  - 2. Use of instrumentation in minimum 10 clients with disorders.*
  - 3. Plan and execute in minimum 5 clients with disorders.*
  - 4. Maintain clinical records.*



PO-201 **PEDAGOGY IN P&O EDUCATION**

1. **Education** :Introduction-Educational Philosophy- Idealism Naturalism, Pragmatism ,Aims of Education ,Functions of Education ,Formal, informal and non formal Education ,Agencies of Education ,Current issues and Trends in Higher Education ,Issue of quality in Higher Education ,Autonomy and Accountability,Privatization of Education
2. **Concept of Teaching and Learning** :Meaning and scope of Educational Psychology,Meaning and Relationship between teaching and learning,Learning Theories ,Dynamics of behavior ,Individual differences
3. **Curriculum** : Meaning and concept ,Basis of curriculum formulation,Framing objectives for curriculum ,Process of curriculum development and factors involved,Evaluation of curriculum
4. **Method and techniques of teaching** : Lecture,Demonstration ,Discussion,Seminar ,Assignment ,Project ,Case Study
5. **Planning for teaching** :Bloom's taxonomy of instructional objectives ,Writing instructional objectives in behavioral terms ,Unit planning ,Lesson planning ,
6. **Teaching aids** :Types of teaching aids ,Principles of selection, preparation and use of audio-visual aides,
7. **Measurement and Evaluation** : Nature of educational measurement: meaning, process, types of tests ,Construction of an achievement test and its analysis ,Standardized test ,Introduction of some standardized tools, important tests of intelligence, Aptitude and personality, Continuous and comprehensive evaluation
8. **Guidance and counseling** : Meaning & concepts of guidance and counseling ,Principles of guidance and counseling
9. **Awareness Programme**:Awareness and guidance to the common people about health and disease.

Reference:

- 1 Developing a Pedagogy of Teacher education: Understanding teaching and learning about teaching.
- 2 Handbook of Technological pedagogical content knowledge (TPCK) for educators
- 3 Language, Culture and community in Teacher education. 27
- 4 Studying Teacher Education The Report of the AERA Panel on Research and Teacher Education
- 5 Reframing Sociocultural Research on Literacy Identity, Agency, and Power
- 6 Education of the masses: A Quest for Pedagogy
- 7 Pedagogy and Learning with ICT
- 8 Changing Mins: Pedagogy of Hope
- 9 Treatise on Pedagogy
- 10 Choral Pedagogy

## **PO202-Administration, Management & Ethical Issues**

### **SECTION I**

#### **Management**

1. **Management:** Introduction, Evolution of management, Functions of management, Management process – planning, organization, direction, controlling decision-making, Budget making
2. **Personnel management:** Staffing, Recruitment, Performance appraisal, Collective bargaining, Job satisfaction
3. **Marketing:** Market segmentation, Channels of distribution, Promotion, Consumer behavior, Cost effective management
4. **Total Quality Management:** Basics of quality management, Quality control, Quality assurance programme in hospitals/rehabilitation centres & medical audit, International quality system

### **SECTION II**

#### **Administration, Legal Ethical Issues**

1. Hospital and rehab organization - Functions and types
2. Roles of Prosthetist & Orthotist in different hierarchy/ work set up.
3. Rules of Professional Conduct.
4. Legal responsibility
5. Code of conduct
6. Functions of P&O associations
7. Role of the International Health Agencies
8. Liability and obligations in the case of medical legal action
9. Law of disability & discrimination confidentiality of the Patient's status.
10. National and International policies/ acts /scheme as relevant to P&O profession (Consumer protection law, health law, MCI, RCI and others)

***Reference:***

- Human Resource Management by NK Singh
- Organizational Behaviour by Archana Tyagi
- Public Power & Administration by Wilenski, Hale & Iremonger
- Physical Therapy Administration & Management by Hickik Robert J
- Management Principles for physiotherapists by Nosse Lorry J.
- Managerial accounting for hospital
- Hospital: planning, design & management
- Medical ethics & consumer protection act
- Health economics in development
- Marketing Management by T.N. Chhabra & S.K. Grover
- Hospital Administration by Dr. S.L. Goel & Dr. R. Kumar
- Principles and Practice of Management by LM Prasad
- Quality Management by Bedi
- Handbook of human resource management
- Personnel /Human Resource Management by Decenzo Robbins

# PO-203 Paper – Advanced Upper Extremity Orthotics

## Objectives

### 1. General Consideration

- 1.1.1. Functional Anatomy of Hand.
- 1.1.2. Bio-mechanical consideration in upper extremity orthotics.
- 1.1.3. Design & fabrication principles.
2. Assessment & analysis of upper extremity specific to orthotic intervention.
3. Upper extremity orthotics & its classification.
4. Orthosis for Shoulder & Elbow.
5. Forearm based orthosis.
6. Hand, Finger, Thumb based orthosis.

### 7. Orthoses for stroke and brain injured patient:

- 7.1.1. General principle, Pathophysiology, Various treatment option, Orthotic treatment, Ergonomic consideration

### 8. Orthoses for spinal cord injury:

- 8.1.1. Pathophysiology, Historical perspective, Assessment and diagnostic tool, Level of injury, Treatment consideration and recommendation, Surgical management, Orthotic management, Research studies and outcome measures

### 9. Orthoses for burned hand:

- 9.1.1. Pathophysiology, Historical perspective, Rehabilitation intervention, Assessment and diagnostic tool, Treatment consideration and recommendation, Therapeutic management, Orthotic management, Splinting outcome, Research studies and outcome measures,

### 10. Orthoses for the arthritic hand and wrist:

- 10.1.1. Pathophysiology, Treatment recommendation, Surgical management, Non surgical management, Orthotic management and principles, Mechanism of action, Ulnar deviation orthoses in rheumatoid arthritis, Post operative care, Post operative orthotic management, Research studies and outcome measures

### 11. Orthoses for brachial plexus injuries:

- 11.1.1. Pathophysiology, Role of medical treatment, Treatment consideration, Role of orthosis and various principle, Research studies and outcome measures

### 12. Orthoses for upper limb fracture:

- 12.1.1. Type of fracture, Complication related fracture, Role of orthotic management, Rational for functional bracing, Functional bracing of diaphyseal humerus fractures, Functional bracing of diaphyseal ulnar fractures, Functional bracing of Colles fractures, Orthoses for protective equipment to the sports, Material used in orthotics, Orthotic consideration, Mechanism of action, Applied biomechanical principle, Open - cell and closed-cell splint, Pneumatic device, Research studies and outcome measures

### 13. Orthoses for overuse disorders of the upper limb:

- 13.1.1. Pathophysiology, Treatment plan, Biomechanical consideration, Orthotic management, Lateral epicondylitis, Capital tunnel syndrome, Carpal tunnel syndrome, De Quervain

tenosynovitis, Trigger finger (stenosing tenosynovitis), CMC arthritis, Operative management, Post operative orthotic management

**Reference:**

- AAOS Atlas of Orthoses and Assistive devices- Hsu, Micheal & Fisk
- Orthotics and Prosthetics in Rehabilitation- Lusardi & Nielsen
- Orthotics in Rehabilitation- McKee & Morgan
- Prosthetics and Orthotics- Shurr & Michael
- Orthotics A Comprehensive Clinical Approach- Edelstein & Brucker
- Hand Rehabilitation- Clark, Wilgis Aiello, Eckhaus & Validata Eddington  
Hand Splinting- Wilton

# **PO-204 Advanced Upper Extremity Prosthetics**

## **1. General consideration:**

- 1.1. Anatomy & Biomechanics of Upper extremity.
- 1.2. Evidence based practice in Upper extremity Prosthetics.
- 1.3. Assessment for patients with upper extremity amputations.
- 1.4. Upper extremity Prosthesis & its components.

## **2. Advancement in the upper extremity prosthetic components:-**

- 2.1. Myoelectric prosthetics
- 2.2. Neuroelectric Prosthetics
- 2.3. Myoacoustic Prosthetics
- 2.4. And other latest developments

## **3. Partial Hand Amputation;**

- 3.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthesis, Current trends in prosthetic management Partial Hand amputation.

## **4. Wrist disarticulation;**

- 4.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthesis, Current trends in prosthetic management Wrist disarticulation.

## **5. Transradial Amputation:**

- 5.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthesis, Current trends in prosthetic management transradial amputation.

## **6. Elbow Disarticulation:**

- 6.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthesis, Current trends in prosthetic management elbow disarticulation.

## **7. Transhumeral amputation:**

- 7.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthesis, Current trends in prosthetic management Transhumeral amputation.

## **8. Shoulder Disarticulation:**

- 8.1. Medical Consideration, Advancement in socket technology, Biomechanics of Prosthesis, Current trends in prosthetic management Shoulder Disarticulation.

9. Prosthetic and orthotic management of Upper limb deficiency.

10. Emerging trends in Upper limb prosthetics: research and development.

11. Fitting and training the bilateral Upper limb amputee.

12. Prosthetic management of multiple limb deficient child

13. Upper -Limb Prosthetic Adaptations for Sports and Recreation.

**Reference:**

- Atlas of amputation and Limb deficiencies- Michael & Bowker
- Orthotics and Prosthetics in Rehabilitation- Lusardi & Nielsen
- Prosthetics and Orthotics- Shurr & Michael
- Amputation and Prosthetics- Bella J May  
Prosthetics and Patient Management- Carroll & Edelstein



## **PO 205 Paper - Spinal Orthotics**

### **1. Biomechanics of spine**

- 1.1.1.1. Physical characteristics of the spine
- 1.1.1.2. The transmitting problem
- 1.1.1.3. Other limiting factor
- 1.1.1.4. Normal kinematics
- 1.1.1.5. Application of force and its resolution
- 1.1.1.6. Creep and biomechanical adaptation

### **2. Spinal orthosis & its Classification**

- 2.1.1.1. Soft spinal orthosis
- 2.1.1.2. Semi rigid spinal orthosis
- 2.1.1.3. Rigid spinal orthosis.

### **3. Principles & Components of spinal orthosis.**

### **4. Techological guidelines for spincal orthosis**

Equilibrium condition, body segment dynamics, 3D effect on spine, visceral organ alignment, progression factors, Centre of Presssure

### **5. Orthosis for Spinal pain: Pathophysiology, Treatment recommendations**

- 5.1.1.1.1. Cervical pain: Mechanism of action of lumber orthosis, Motion restriction, Unloading of spinal column, Side effect and other consideration, Outcome studies and effectiveness of lumber orthosis
- 5.1.1.1.2. Lumbar pain: Mechanism of action of lumber orthosis, Motion restriction, Unloading of spinal column, Side effect and other consideration, Outcome studies and effectiveness of lumber orthosis , Orthosis for spinal deformities.

### **6. Orthotic management of Scoliosis :**

- 6.1. Anatomical consideration, Pathophysiology , Biomechanical consideration involved in treatment, Terminology and Classification of scoliosis, Test and measures used in the clinical examination, Treatment consideration, Use of Radiograph in Diagnosis, digital measurement techniques, Surgical intervention for scoliosis, Nonsurgical intervention for scoliosis, Orthotic management

### **7. Kyphosis :**

- 7.1.1. Pathophysiology, Biomechanical consideration , Treatment consideration, Orthotic management, Scheuermann's kyphosis , post traumatic kyphosis

## **8. Spondylosis, spondylolisthesis & spondylolysis:**

Pathophysiology, Biomechanical consideration, Classification, Treatment consideration, Orthotic management.

## **9. Orthosis for spinal fracture and trauma:**

Pathophysiology of fracture, Mechanism of injury, Classification of fracture, effects and complications of spinal fractures, Cervical spine fracture, Facet joint dislocation, Thoracic and thoraco-lumbar spine fracture, Lumber spine fracture, Post operative care, Important consideration for orthotic postoperative management, Orthotic treatment in spinal fracture, Compression fracture, Burst fracture, Seat belt fracture, Chance fracture, Hangman fracture, Odontoid fracture, Jefferson fracture, Current issues and research.

## **10. Orthosis for spinal cord injured patient:**

Level of injury, Pathophysiology, problem in spinal cord injury, Biomechanical consideration, Treatment consideration, Impact of orthotic management in SCI patient, Type of orthotic device used in SCI patient, Current issue and researches.

## **11. Orthosis for Osteoporosis:**

Pathophysiology, Biomechanical consideration, Clinical assessment and Orthotic management, Treatment consideration, Posture training support, Lumbosacral corset and dorsolumbosacral corset, TLSO- saggital plane control, Posterior shell TLSO, Management of acute and chronic pain, Current issues and research.

## **12. Orthosis in spinal instability:**

Biomechanics, Pathophysiology in spinal instability, Role of Orthotic treatment, Type of spinal orthosis, Cervical orthosis, Cervicothoracic orthosis, Sterno occipitomandibular immobilizers, Yale cervicothoracic orthosis, Minerva cervicothoracic orthosis, Halo orthosis, WISS orthosis, Other cervicothoracic orthosis. Effects of body alignment, balance and compensation.

## **Reference:**

- AAOS Atlas of Orthoses and Assistive devices- Hsu, Micheal & Fisk
- Orthotics and Prosthetics in Rehabilitation- Lusardi & Nielsen
- Clinical Biomechanics of Spine -White and Punjabi
- Clinical Kinesiology
- Biomechanics of Spine

## **PO-206 ASSISTIVE TECHNOLOGY**

### **Assistive devices**

1. Introduction & Definition of Technology.
2. Appropriate technology for Assistive devices in low income countries.
3. Latest development in mobility devices
4. Seating & positioning for Disabled Children & adults.
5. Ergonomic considerations in prescription of wheel chair
6. Technological application
7. Assistive devices for recreation.
8. Sports adaptation for the physically challenged athlete.
9. Driving & related assistive devices.
10. Robotics devices for Rehabilitation for the person with spinal injuries.
11. Matching Technology to Human needs
12. Role of Assistive Technology in Rehabilitation
13. Service Delivery models – CBR, Health Care
14. Societal & Professional issues regarding technology service delivery
15. Concept of Telemedicine / Rehabilitation and Information Technology
16. Current practice and recent advances (including material technology)

### **17. ENVIRONMENTAL ADAPTATIONS**

- 17.1. Introduction
- 17.2. Universal Design
- 17.3. Regulations concerning accessibility to physical environment
- 17.4. Elimination of environmental barriers
- 17.5. Determination of personal role choice
- 17.6. Designs for maximizing performance within the environment
- 17.7. Working conditions

### **Reference:**

- Assistive Technology-Cook & Huseys
- Wheelchair Selection and Configuration- Rory Cooper
- Physical rehabilitation- Sullivan
- AAOS Atlas of Orthoses and Assistive devices- Hsu, Micheal & Fisk

## **PO 108 CLINICAL PRACTICUM- PROSTHOTICS (Upper Extremity)**

### **Objectives**

1. *The student should be able to assess, diagnose, plan and execute for children and adults with various amputation (congenital and acquired).*
2. *To maintain clinical record.*
3. *Assessment of minimum 20 clients with various amputation (congenital and acquired) .*
4. *Use of instrumentation in minimum 10 clients with amputation (congenital and acquired).*
5. *Plan and execute in minimum 5 clients with amputation (congenital and acquired).*

## **PO 109 CLINICAL PRACTICUM- ORTHOTICS (Upper Extremity)**

### **Objectives**

1. *The student should be able to assess, diagnose, plan and execute for children and adults with various disorders/deformity.*
2. *To maintain clinical record.*
3. *Assessment of minimum 20 clients with various disorders/deformity.*
4. *Use of instrumentation in minimum 20 clients with disorders/deformity.*
5. *Plan and execute in minimum 5 clients in each category.*

## **PO 109 CLINICAL PRACTICUM- SPINAL ORTHOTICS**

### **Objectives**

1. *The student should be able to assess, diagnose, plan and execute for children and adults with various disorders/deformity of spine.*
2. *To maintain clinical record.*
3. *Assessment of minimum 20 clients with various disorders/deformity.*
4. *Use of instrumentation in minimum 20 clients with disorders/deformity.*
5. *Plan and execute in minimum 5 clients in each category.*