

**DIPLOMA IN PROSTHETICS & ORTHOTICS
(DPO)**

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

Diploma in Prosthetics & Orthotics

1. Structure of the Course

1.1

(a) General Objective

The principle objective of this course is the training of men and women as Prosthetic and Orthotic Technician to meet the growing requirement for, well qualified personnel competent to undertake this very specialized type of work in the country. Prosthetist / Orthotist is the specialist who in the exercise and pursuit of the art of prosthetics / Orthotics designs, fabricates, and fits prostheses (artificial limbs) and orthoses (Braces, supports, accessories and remedial devices for locomotor handicapped) prescribed by a clinical team headed by a Prosthetists / Orthotists / Physical Medicine Specialist / Orthopaedic Surgeon.

(b) Instructional Objective

The instructional objectives of the course is that the course contents and training given in theory and practical work in the subjects and clinical practices offered should enable the Prosthetic and Orthotic Technician qualified to work with Physicians, Therapists and other professionals in the field of Rehabilitation in the clinical environment. The candidates so trained to solve problems and apply basic principles in their work. Aiming at these objective the course syllabus include lectures, classroom work and practical demonstration, and practical work in Prosthetic and Orthotic laboratories, during which the students are introduced to clinical practices and learn the fundamentals of manufacturing, measuring and fitting of appliances.

1.2. Entry requirements

A pass in the Higher Secondary Examination (10+2) in science subject, viz Physics, Chemistry, Biology and/or Mathematics.

OR

A pass in the final diploma examinations conducted by the Board of Technical Education of the State Govt. in Mechanical, Electrical/ or Electronics Engineering are also eligible.

A minimum of 50% marks in each of the core subject will be required for admission to the course. In the case of reserved category, this may be relaxed to 45%.

1.3. Duration of the course

The course duration is two Years

2. Courses Organization
A General

2. I A. Faculty

S.N.	Designation	Qualification
1.	Assistant Professor/ Lecturer (Prosthetics & Orthotics)	Bachelor in Prosthetics and Orthotics with 03 years teaching experience. OR Diploma in Prosthetics and Orthotics with 05 years teaching experience can be considered. OR Post Graduate in Prosthetics and Orthotics) with 01 years teaching experience.
2.	Demonstrators/ Tutor Prosthetics & Orthotics	Bachelor in Prosthetics and Orthotics with 02 years teaching experience OR Diploma in Prosthetics and Orthotics with 04 years teaching experience can be considered. OR Post Graduate in Prosthetics and Orthotics)
3.	Instructors in Surgical Shoes/ Leather Work	Diploma in Foot Wear Technology with a minimum of 2 years experience in Orthotics & Prosthetics, surgical shoe making from a recognized institution.

Recommended Staff pattern for conducting two Years Diploma Course in Prosthetic /
Orthotics. (Student Teacher Ratio 1 : 10)

1. Lecturers / Assistant Prof. in Prosthetics / Orthotics 04
2. Demonstrator in Prosthetics / Orthotics 04
3. Instructors in Surgical shoes / Leather work02
4. Visiting Faculty
 1. Technical Drawing
 2. Rehabilitation Psychology
 3. Anatomy & Physiology
 4. Pathology
 5. Orthopaedic
 6. Amputation Surgery
 7. Workshop Technology materials tools, and equipment

Course Coordinator: Senior faculty from the field of Prosthetics and Orthotics will act as
Course Coordinator.

Accessible

2.3 Space and other Facilities

- a. Two lecture halls
- b. Conference Room
- c. One fitting rooms / Gait training room
- d. One measurement room
- e. One plaster cast / modification
- g. One prosthetic laboratory
- h. One orthotic laboratory
- i. One leather shop and surgical shoes section
- j. One office room
- k. One faculty room
- m. One Assessment room
- o. One store room
- p. One waiting hall for patients
- s. One library room

The above space requirements needed for prosthetic/orthotic training only. Space requirements for hospital treatment physio/occupational therapy and allied departments for rehabilitation and exhibits of models are not included.

2.4 Library Facilities

A well equipped library consisting the students textbooks on Prosthetics, Orthotics, Rehabilitation Medicine, Physiotherapy, Occupational Therapy, Bio-mechanics, Bio-engineering, Bio-electric, electrical, mechanical, electronics, plastics, leather and basic subjects like anatomy, physiology, biology, mathematics, pathology, orthopedics, amputation surgery, medical dictionary, etc. is required for the Institutions which teaches Prosthetics and Orthotics.

A collection of anatomical, physiological charts, articular and disarticular skeleton, audio & visual aids like slides, video films etc. are needed. Audio / Video equipments like slide projector, 16 mm sound projector, overhead projector / LCD projector, epaediastroscope are also required for use as teaching aids.

a Periodicals and journals on prosthetics, orthotics, Rehabilitation Medicine, Bio-engineering etc. are to be kept in the library. (A list of books and periodicals and journals are enclosed in Appendix-1).

3. Examinations

A. Admission Process

Selection will be made strictly on merit on the following basis: -

- a. Percentage of marks (average) in core subjects at the minimum entry qualifying examinations.
- b. Percentage of marks in assessment test.

B. Final Evaluation

Examinations in theory / practical will be conducted at the end of each term. Besides, this internal assessment will be made on the candidate's individual performance in project work, group performance, acquisition of knowledge, skill and aptitude for the rehabilitation, educational and management work. Separate marks will be set apart for this internal assessment and will be taken into account in the final evaluation of the candidate for successful completion of the course.

Pass marks: aggregate 50% and minimum of 40% in each subject in the final examination which will be conducted by the Examination Board. First Class: 60% and Second Class: 50%. (or as per the Scheme of Examination of RCI)

Course Outline

a. Study hours available (Approx.)

There would be total of 220 working days in a year consisting of 6 working hours per day.

1st Year

S.No.	Subject	Theory hrs.	Practical hrs.	Exam. hrs.	Total hrs.	Exam Marks
Paper 1.	Life/Basic Science Anatomy Physiology Pathology	65 55 45	45 35	3	250	200
Paper 2.	Workshop Technology & Practice,	153	-	4	157	200
Paper 3.	Applied Mechanics & Strength of Material Electronics & Bio-Electricity	114 35	-	3	224	100
Paper 4.	Orthopedics, Amputation Surgery Kinesiology & Bio-Mechanics	107+ 84 +16	-	3	194	200
Paper 5.	Prosthetics L.E.	100	383	3+6 (P)	492	100 (Th) 100 (P)
Paper 6.	Orthotic L.E.	100	268	3+6 (P)	352	100 (Th) 100 (P)
Total	959		463	31	1453	1100

Th = Theory

P = Practical

Total teaching hours in a year is = 1453

No. of Theory papers = 6

No. of Practical papers = 2

2nd Year

S. No.	Subject	Theory hours	Practical hours	Exam hours	Total hours	Exam marks
Paper 7	Introduction to PMR, Rehab Psychology, Workshop Admn. & Management	150	-	3	150	100
Paper 8	Prosthetics U.E.	100	267	3+6 (P)	367	100 (Th) 100 (P)
Paper 9	Orthotic U.E.	50	114	3+6 (P)	163	100 (Th) 100 (P)
Paper 10	Spinal Orthotic	100	166	3+6 (P)	225	100 (Th) 100 (P)
Paper 11	Case conference, Educational tour Report	-	208	6	214	200
Total		407	1025	33	1468	900

Th = Theory

P = Practical

Total teaching hours in a year = 1468

Total No. of Theory papers = 4

Total No. of Practical papers = 4

Total teaching hours in the course curriculum = 1453+1468

= 2921 hours

Detailed Syllabus
Paper–I Life/Basic Science (165 Hours)
Anatomy (65 Hours)

S. No.	Topic Breakdown	Theory (Hrs.)	Lab / Field works (Hrs)
1.	Introduction to human body terminology used.	2 Hrs.	-
2.	The skeleton classification of bones, terms used in describing bones	5 Hrs.	3 Hrs.
3.	The skull	1 Hrs.	1 Hrs.
4.	The Thorax	1 Hrs.	1 Hrs.
5.	The Vertebral Coloumn	2 Hrs.	1 Hrs.
6.	The Pelvic girdle	1 Hrs.	1 Hrs.
7.	The skeleton of upper Limb Scapula, Humerus, Ulna, Radius, Bones of wrist & hands	2 Hrs.	-
8.	The skeleton of Lower Extremity. The innominate bone, femur, Patella, Tibia, Febula Bones of the foot.	4 Hrs.	-
9.	The Joint of the Skeleton classification & Types	2 Hrs.	-
10.	Joints of Upper Extremity	1 Hrs.	1 Hrs.
11.	Joints of Lower Extremity, Knee, Ankle & Joints of the foot.	4 Hrs.	1 Hrs.
12.	Myelogy – the muscle of the skeleton, Name of Muscles & their derivation.	3 Hrs.	1 Hrs.
13.	Muscle of the head & face- Position, attachments, action & nerve supply	3 Hrs.	1 Hrs.
14.	Muscle of the neck, Position, attachments, action & nerve supply.	3 Hrs.	1 Hrs.
15.	Muscle of the Chest- Position, attachments, action & nerve supply	3 Hrs.	1 Hrs.
16.	Muscles of the Back - Position, attachments, action & nerve supply	4 Hrs.	2 Hrs.
17.	Abdominal muscles- Position, attachments, action & nerve supply	3 Hrs.	2 Hrs.

18.	Muscle of the Upper Extremity- Position, attachments, action & nerve supply	7 Hrs.	3 Hrs.
19.	Muscles of the Lower Extremity- Position, attachments, action & nerve supply	7 Hrs.	3 Hrs.
20	Anatomical regions formation & contents of Axilla, anticubital fossa, anterior & posterior triangle of neck, femoral triangle, popliteal space	2 Hrs.	2 Hrs.
21	Living anatomy - recognition of structure in living body by inspection & palpation.	2 Hrs.	2 Hrs.
22.	Ability to replace the surface of the living body, the position of the chief structures	-	3 Hrs.
Total		62 Hrs.	30 Hrs.

Reference Books

1. Gray's Anatomy
2. Gate's Primary Anatomy
3. Anatomy & Physiology for Nurses By V.E. Pearce

Notes

1. Each topic should be taught with Articular skeleton and disarticulated bones- charts also can be used.
2. Manuals for study to be prepared and given to students.
3. For field work, the students are to be taken to Anatomy Department of a Medical College for visit and demonstration to be given.

Physiology (55 Hours)

S.No	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Introduction to physiology & different systems of the body	1 Hrs.	-
2.	Body fluids, tissue cells, cytoplasm, nucleus, irritability, conductivity, reproduction.	5 Hrs.	1 Hrs.
3.	Elementary tissue of the body & their functions development & growth of bones	6 Hrs.	1 Hrs.
4.	The circulatory system - Heart, Blood vessels attached to it & nerve supply of the heart, cardiac cycle of the heart, cardiac cycle, the heart sounds, the pulse, blood pressure, the cardiac output, circulation of blood throughout body, Principal blood vessels, arteries & veins.	10 Hrs.	5 Hrs.
5.	The blood composition of blood & functions – the coagulation of blood.	4 Hrs.	4 Hrs.
6.	The spleen & the Reticula Endothelial system	1 Hrs.	1 Hrs.
7.	The classification of food	2 Hrs.	2 Hrs.
8.	The digestive system	4 Hrs.	2 Hrs.
9.	The liver & pancreas	2 Hrs.	2 Hrs.
10.	The respiratory system and respiration	3 Hrs.	1 Hrs.
11.	Metabolism	1 Hrs.	1 Hrs.
12.	Endocrine glands.	1 Hrs.	1 Hrs.
13.	Urinary system	2 Hrs.	1 Hrs.
14.	Reproductive system	1 Hrs.	1 Hrs.
15.	The nervous system - sympathetic, parasympathetic	5 Hrs.	6 Hrs.
16.	Organs of special senses and skin	2 Hrs.	1 Hrs.
Total		50 Hrs.	30 Hrs.

Reference Books: -

Anatomy & Physiology for Users by Evelyn Pearch.

Pathology (45 Hours)

S.No	Topic Breakdown	Theory (Hrs.)	Lab / Field works (Hrs)
1.	Introduction to pathology, General pathology	2 Hrs.	
2.	Inflammation – signs and symptoms – types of inflammation, Acute & Chronic inflammation	2 Hrs.	
3.	Infections – Bacteria and viruses, immunity, types, classification, control of infection, cross infection & prevention. Asopsis and sterilization, pyogenic infection – boils, abscess setticamla, Tuberculous infection of bones & joints & management. Fungle infection – actiriomycosis, filariasis, leprosy, veneral disease syphilis, gonorrohea, virus infection – poliomyelitis influence.	10 Hrs.	
4.	Wounds – types of healing process	2 Hrs.	
5.	Gangrene – types, causes, signs & symptoms and management.	2 Hrs.	
6.	Inflammation of joints – Arthritis – classification and pathology	8 Hrs.	
	Total	53 Hrs.	22 Hrs.

Reference Books

Text book of the Practice & Medicine

Paper II**Workshop Technology & Practice (272 Hrs.)****Workshop Technology (153 Hrs.)**

S. No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Introduction to workshop technology	1 Hrs.	-
2.	Bench work-bench vice, leg vice, hand vice, hammers of different types, Files of various types, Chisels, Scrappers & their uses. Hack saws, wrenches, surface plate, angle plate, V-block Centre Punches, dividers & trammmels, feeler & surface gauges, etc.	5 Hrs.	5 Hrs.
3.	Measuring Tools – scales & tapes, calipers, Micrometer, Vernier calipers, gauges, plug gauges, dial gauges, vernier protractors sine bars, indicators.	6 Hrs.	4 Hrs.
4.	Fundamentals of rivetting soldering, brazing and welding.	2 Hrs.	2 Hrs.
5.	Forging (blacksmithy) -the forge & tools used in smithy & forging processes.	2 Hrs.	
6.	Drilling-Machine operation, tools holding devices, types of drill, reamers and uses, cutting internal- external threads, by using taps and dies, counter sinking, counter boring.	5 Hrs.	2 Hrs.
7.	Lathe work-parts of centre lathe and their uses, turning of centre, taper burning screw cutting in lathe, cutting tools used in lathe, tools speed, feed and depth of cut.	5 Hrs.	5 Hrs.
8.	Milling types of milling machines, Milling cutter, Up-cut & cone cut milling dividing head, set-up and operation on milling machine	5 Hrs.	5 Hrs.
9.	Shaping – Shaping machine and their use.	2 Hrs.	2 Hrs.
10.	Grinding – The grinding wheels, abrusies, wheel bends, grit & grade, wheel structure, shape, selection, hand grinders, speed & feed, types of grinding & different types of grinding machines.	5 Hrs.	5 Hrs.
11.	Finishing process polishing, buffing, electroplating, copper, nickel and chromium.	5 Hrs.	5 Hrs.
12.	Material & Tools used in Prosthetics & Orthotics; - a. Rubber- different types uses, density, resilience, utility in prosthetic & Orthotics	10 Hrs	
	b. Plastics-types, strength impregnation, lamination colouring & utility:	5 Hrs.	5 Hrs.

	c. Ferrous metals – Steel variety & uses	4 Hrs.	-
	d. Non-ferrous metals and alloys, aluminum, various suitability.	6 Hrs.	-
	e. Fabrics	2 Hrs.	2 Hrs.
	f. Leather	4 Hrs.	1 Hrs.
	g. Plaster of Paris	3 Hrs.	2 Hrs.
	h. Adhesive & Fasteners	3 Hrs.	2 Hrs.
	i. Special tools & equipments used in prosthetic & orthotic work	8 Hrs	3Hrs
	Total	96 Hrs.	57 Hrs.

Notes: - 1. Lecture should follow by demonstration of use of tools and equipments.

2. Students should be taken to an I.T.I / Polytechnic / Engineering College to see the different machinery, equipments and their actual uses in engineering workshop practice.

Reference Books: -

1. Tools & Materials for Prosthetists
2. Tools & Materials for Orthotists N.Y.U. Publication
3. Workshop Technology & Practice – By Chapman.

Paper III**Applied Mechanics & Strength of Material & Electronics & Bio-Electricity (221 Hours)****Applied Mechanics & Strength of Material (114 Hours)**

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Simple stress & strains Definition of stress and strains, factor of safety, safe stress, modulus of elasticity, longitudinal strain and lateral strains, Poisson's ratio, etc. –	10 Hrs.	3 Hrs.
2.	Geometric properties of sections Definition of moment inertia & radius of gyration of a solid body. Definition of centroid, moment of inertia of sections, determining of centroid of 'L' section,	3 Hrs.	1 Hrs.
3.	Shear Stress & Bending moments Classification of beams, types of loads, definition of shear force & bending moment of a loaded beam	5 Hrs.	2 Hrs.
5.	Torsion Definition of torsion, angle of twist, polar moment of inertia etc. assumption made in torsion,	3 Hrs.	1 Hrs.
6.	Springs Types of springs, uses of various springs, development of formulae for stiffness & deflection of closely coiled helical springs – simple problems.	3 Hrs.	1 Hrs.
7.	Riveted Joints Types of riveted joints, strength of joints,	3 Hrs.	2 Hrs.
9.	Friction Principles of friction – co-efficient of, definition of static & dynamic friction, laws of static friction, least force required to drag a body on horizontal plane, angle of repose frictional force on inclined plane simple problems.	8 Hrs.	1 Hrs.
	Total	98 Hrs.	16 Hrs.

Electronics & Bio-Electricity (107 Hours)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Fundamental of Electricity Ohm's Law. Resistance in Parallel & series AC + DC resistance capacitance, impedance-power, power factor, transformers, meters	3 Hrs.	10 Hrs.
2.	Elements of Electronics Vacuum tubes, Diode, Electrode, Tetrode, Pentode, Electrification, valve as rectifier valve as amplifier semi-conductors, integrated circuit, computers.	6Hrs.	14 Hrs.
3.	Bio-Electricity Biological potentials, muscle action potentials, electromyography, myoelectricity control of artificial arms, Bio-cybernetics.	5 Hrs.	14 Hrs.
Total		69 Hrs.	38 Hrs.

Reference Books: -

1. Biological & Medical Electronics by Ralph. W. Stach, Ph.D. London.
2. Bio-electricity by E.E. Svek / Ling D.E.E.

Notes: - The students should be made to do the following & experiments each of 6 hours approx.

1. Calibration of liner & long type potentiometers.
2. Rigging up and calibration of electrogoniometers.
3. Rigging up and calibration of wire strain gauge transducers.
4. Study and use of low-level preamplifiers with oscilloscope to record muscles potential.
5. Study and use of electro-myographic equipment to record muscle potential.
6. Study and use of stimulators.
7. Study and use of myoelectric arms.
8. Study and use of EEG equipments for Kinesiological studies.

Paper- IV**Orthopaedics, Amputation Surgery & Kinesiology & Bio-mechanics (191 Hours)****Orthopaedics (69 Hours)**

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Introduction to Orthopaedics	1 Hrs.	-
2.	Principles of Orthopaedics	.	-
3.	Congenital deformities	2 Hrs	-
4.	Diseases of Nervous System	2 Hrs.	-
5.	Poliomyelitis	2 Hrs.	-
6.	Obstetrical paralysis	1 Hrs.	-
7.	CP	2 Hrs.	-
8.	Hemiplegia	1 Hrs.	-
9.	Paraplegia	2 Hrs.	-
10.	Pyoenic infection	1 Hrs.	-
11.	Tuberculosis	2 Hrs.	-
12.	Leprosy	2 Hrs.	-
13.	Chronic arthritis	2 Hrs.	-
14.	Rheumatoid arthritis	2 Hrs.	-
15.	Osteoarthritis	2 Hrs.	-
16.	Neuropathic arthritis	2 Hrs.	-
17.	Metabolic diseases	2 Hrs.	-
18.	Rickets	2 Hrs.	-
19.	Avitaminosis	1 Hrs.	-
21.	Bone tumours	3 hrs.	-
22.	Trauma	2 Hrs.	-
23.	Fractures upper extremity	2 Hrs.	-
24.	Fracture lower extremity	2 Hrs.	-
25.	Spine fractures and dislocation	3 Hrs.	-
Total		66 hrs.	3 Hrs.

Reference Book: - Outline of Orthopaedic by Adams

Note: - Demonstration should be made with case as far as possible. Visual aids should be shown with each lecture.

Amputation (38 Hours)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field works (Hrs)
1.	Introduction to amputation surgery – indications	1 Hrs.	-
2.	Principles of amputation, types, techniques.	2 Hrs.	-
3.	Amputation in children (Upper & Lower Extremity)	2 Hrs.	-
4.	Amputation in adults (Upper extremity) and its complications (various levels)	2 Hrs.	-
5.	Amputation in lower extremity & its complications (various levels)	2 Hrs.	-
6.	Postoperative care of the stump properties of good stump.	2 Hrs.	-
7.	Examination & prescription	1 Hrs.	-
8.	Stump dermatology	2 Hrs.	-
9.	Common skin diseases and their management	.	-
10.	Care of Stump	1 Hrs.	-
11.	Latest techniques of amputation Myodesis – Myoplasty	2 Hrs.	-
Total		32 Hrs.	6 hrs.

Notes: -

1. Topics should be covered in a simple manner to the required extent of knowledge required by a Prosthetist.
2. Presentation of cases, charts, slides and other mode of teaching aids are required for demonstration to students.
3. Student may be taken to an operation theatre for observation of performance of any one amputation surgery.

Kinesiology & Bio- mechanics (84 Hours)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Definition of Kinesiology & Bio-mechanics	2 Hrs.	-
4.	Definition of Kinetics & Kinematics	1 Hrs.	1 Hr.
5.	Centre of gravity of human body.	1 Hrs.	1 Hrs.
6.	Segment masses & the density of parts.	1 Hrs.	1 Hrs.
8.	Segment of centres of gravity	1 Hrs.	1 Hrs.
9.	human movements & its significance	2 Hrs.	1 Hrs.
10.	Forms of human movement their characteristics & factors affecting them.		1 Hrs.
11.	Analysis of movement.	2 Hrs.	1 Hrs.
12.	Body links and motion of parts.	1 Hrs.	1 Hrs.
13.	Closed chain systems.	1 Hrs.	-
14.	Open chain system.	1 Hrs.	-
15.	Four bar mechanism.	1 Hrs.	-
16.	Measurement of joint motion.	2 Hrs.	1 Hrs.
17.	Electrogonio-metric method	2 Hrs.	1 Hrs.
18.	Mechanics of the spine	2 Hrs.	1 Hrs.
19.	Lumbar discometry	1 Hrs.	1 Hrs.
20.	Human Locomotion	3 Hrs.	2 Hrs.
21.	Bio-mechanics of lower extremity	2 Hrs.	1 Hr.
22.	Bio-mechanics of upper extremity	2 Hrs.	1 Hr.
22.	Gait analysis	3 Hrs.	2 Hrs.
23.	Bio-mechanics of squatting	2 Hrs.	-
24.	Total	64 Hrs.	20 Hrs.

Note: -The Bio-mechanics of various types of prosthesis and orthosis are included in the syllabus of the respective subjects in subsequent semesters.

Paper V
Prosthetics (Upper Extremity) (337 Hours)

S.N.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
	(i) Classification by level of amputation.	3 Hrs.	-
	(ii) Medical consideration applied anatomy and pathological consideration	2 Hrs.	-
	(iii) Classification of congenital skeletal limb deficiencies	2 Hrs.	1Hrs.
	(iv) Prosthetic prescription	2 Hrs.	2 Hrs.
	(v) Amputee trainee		
	(i) Components of upper extremity prostheses, control & harness systems.	3 Hrs.	8 Hrs.
	(ii) Fabrication principle & procedures for upper extremity prostheses.	3 Hrs.	72 Hrs.
	(iii) Measurement fitting & alignment	2 Hrs.	36 Hrs.
	(iv) Check-out & care of B.E. prostheses.	2 Hrs.	22 Hrs.
	(v) Bio-mechanics of U.E. prostheses.	2Hrs.	10 Hrs.
	(vi) Harness & control systems Below Elbow harnessing & this causes, shoulder amputee harnessing.	5 Hrs.	28 Hrs.
	(vii) Clinical aspects of U.E. prosthesis	3 Hrs.	24 Hrs.
	(viii) Training in the use of U.E. prosthesis		24 Hrs.

	(ix) Electro-mechanical myoelectric and other externally powered prostheses	2 Hrs.	28 Hrs.
	(x) Study of publication sources for updating information on upper limb prostheses	1 Hrs.	12 Hrs.
	Total	70 Hrs.	267 Hrs.

Paper VI : Orthotic (Upper Extremity) (154 Hours)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work(Hrs)
1.		a. Medical	
	(i) Functional anatomy of the hand	2 Hrs.	2 Hrs.
	(ii) How to train the patients to use functional splint & arms braces.	2 Hrs.	4 Hrs.
2.		b. Technical	
	Measurement, selection of materials & components, fabrication & fitting of the following: (i) Static fingers hand splints. (ii) Functional hand splints (iii) Functional arm braces (iv) Feeders (v) Special assistive devices (vi) Myoelectric & other externally powered upper extremity orthoses	12 Hrs.	98 Hrs.
	3. Biomechanics of functional hand splints and arm Orthosis	3 Hrs.	10 Hrs.
	Total	40 Hrs.	114 Hrs.

Reference Books: -

1. Upper Extremity Orthosis – Miles. H. Anderson.
2. Manuals of U.E. Orthosis- N.Y. University
3. Orthotics Atlas, Vol. I - American Academy of Orthopaedic Surgeons.

nd
2 Year
Paper VII
P.M.R. & Introduction to Rehabilitation & Psychology & Workshop
Administration & Management (182 Hours)
P.M.R. (83 Hours)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Introduction to Physical Medicine & Rehabilitation.	1Hrs.	-
2.	Muscle charting	3 Hrs.	8 Hrs.
3.	Electro-therapy	2 Hrs.	6 Hrs.
4.	Hydro-therapy	1 Hrs.	1 Hrs.
5.	Application of the above topics in management of disabling conditions	2 Hrs.	2 Hrs.
6.	Neuro muscular diseases type and management	4 Hrs.	2 Hrs.
7.	Arthritis, types and management	2 Hrs.	2 Hrs.
8.	Crutches & uses, different mobility and assistive devices	6 Hrs.	2 Hrs.
9.	Bandaging of stumps, BK/AK etc. Knees, Elbows, Hands, Wrists and Ankles.	2 Hrs.	4 Hrs.
10.	Gait training & analysis of patients fitted with orthoses & prostheses	6 Hrs	6 Hrs.
11.	Prescription of appliances.	1 Hrs.	-
Total		50 Hrs.	33 Hrs.

Introduction to the Course, Rehabilitation & Psychological Aspects (29 Hours)

S. N.	Topic breakdown	Lecture theory (hrs.)	Lab. Practical field work
1.	Introduction to the subject		3 hrs.
2.	Visit to various department, of the institution.		
3.	General idea & definition of prosthetics / orthotics		
4.	Function of different sections / departments of the institute		
5.	Rehabilitation a. Concept of Rehabilitation b. Total Rehabilitation c. Rehabilitation team and role of each member of the team.		3 hrs.
6.	Psychology of disabled a. Goals & methods of scientific psychology		1 hrs
	b. Normal personality, normal growth & development c. Heredity d. Maturation		3 hrs
	e. Environment & Learning factors in intellectual & Social Development.		4 Hrs.
	f. Psychometry g. Testing & motivation		2 Hrs.
	h. Emotional life of the disabled & psychological assessment	2 Hrs.	2 Hrs.
	i. Counselling	2 Hrs.	
7.	Social & Vocational Aspects		

	a. Disability & social effects b. Home environment of disabled	2 hrs	
	CBR – concept and application	3	
	c. Attitude of the society d. Vocational problems	2 hrs.	
	e. Vocational assessment	1hrs.	2 hrs.
	f. Vocational counselling and guidance	1 hrs.	
	g. Follow up	1 hrs.	
		25hrs.	4 hrs.

- Notes: - 1. Lectures should be given along with teaching aids, like slides, charts etc.
2. Notes / Précis on the subject is to be given.
3. Demonstration on patients should be shown first and students should independently do the assessment later on patients.

Reference Books

1. Psychology by Munn N.L.
2. Development Psychology - by Hurlock E.B.
3. Child Development - do –
4. Rehabilitation Medicine - by Howard A.Rusk
5. Rehabilitation Medicine - by PJR. Nicholas
6. Workshop for the disabled - by Chownard E.L. & Gay
7. Psychology Testing - by Anastasi A.
8. Abnormal Psychology - by Brown
9. Educational Psychology - by Grow & Grow.

Journal: -

1. Journal of Rehabilitation in Asia Published by Indian Society for Rehabilitation of Handicapped.

Workshop Administration & Management (70 Hours)

S.No	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Workshop administrative and management structure	2 Hrs.	-
5.	Foremanship & Duties of forman & qualities of forman	2 Hrs.	-
6.	Store & Store Organisation Purpose of store keeping, store location, layout of stores, systems of location of materials, methods of storing Biocard, Indent of stores material returned, Accounting of stores, registers, advantages of good stores keeping.	6 Hrs.	-
7.	Purchase procedures Functions of purchase department, methods of purchasing, purchase procedures.	3 Hrs.	-
8.	Cost Accounting Closing of job cards and work orders	3 Hrs.	-
9.	Accident Hazards and Industrial Safety Introduction to safety and management function, basic principles of accident prevention, Physical and Psychological factors in safety, occupational hygiene and health, safety in engineering & industry safety in prosthetic & orthotic workshop	3 Hrs.	2 Hrs.
10.	First Aid Wounds, antiseptics, bandages, splints, and their practical uses, care of injured cares	6 Hrs.	3 Hrs.
	Practical demonstration of handling the casualties of various types.	-	3 Hrs.
	Artificial respiration, practical demonstration	1 Hrs.	1 Hrs.
	Practical demonstration or external cardiac message.	-	1 Hrs.
	Transportation of Casualties	1	1
	Total	55 Hrs.	15 Hrs.

Paper VIII - Prosthetics (Lower Extremity) (483 Hours)

S.N.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
		1.	Medical Subjects
	(i) Levels of amputation & limiting factor (lower extremity)	2 Hrs.	-
	(ii) Psychological aspects of amputation	1 Hrs.	-
	(iii) Classification of congenital skeletal limb deficiencies.	2 Hrs.	-
	(iv) Prosthetic / Orthotic assessment and evaluation techniques	2 Hrs.	2 Hrs.
	(v) Prosthetic prescription	1 Hrs.	1 Hrs
	(vi) Immediate & early Prosthetic management	2 Hrs.	3 Hrs.
		2.	Technical
	(i) Prosthetic components below knee & above knee	6 Hrs.	10 Hrs.
	(ii) Examination of stump, measurement, cast taking POP modification, fabrication, alignment & fitting procedures for below knee & above knee amputations (this include prosthesis for partial foot, choparts, syme's below knee, through knee above knee amputations.	30 Hrs.	240 Hrs.
	(iii) Gait analysis of BK/ AK amputees fitted with prostheses.	2 Hrs.	4 Hrs.
	(iv) Check out of below knee & above knee prosthesis	2 Hrs.	4 Hrs.
	(v) Maintenance & care of prosthesis	2 Hrs.	1 Hrs
	(vi) Hip disarticulation & Hemipelvectomy prosthesis	6 Hrs.	70 Hrs.
	(vii) Bio-mechanics of below knee, above knee & hip disarticulation prosthesis	12 Hrs.	1
	(viii) Fluid controlled prosthesis	3 Hrs.	2 Hrs.
	(ix) Modular & other modern types of prosthesis	6 Hrs.	12 Hrs.
	(x) Development of squatting type prosthesis – Madras & Jaipur port, etc,	2 Hrs.	14 Hrs.
	(xi) Study of publication of sources for updating information on L.E. Prosthesis Examination	2 Hrs.	4 Hrs.
	Total	100 Hrs.	383 Hrs.

Paper IX - Orthotic (Lower Extremity) (343 Hours)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.		Foot Orthoses	
a. Medical			
	(i) Anatomy of Foot	3 Hrs.	-
	(ii) Orthotic - Prescription for different pathological condition, pathomechanics of foot & ankles.	4 Hrs.	8 Hrs.
b. Technical			
	(i) Shoes, boots & their components	4 Hrs.	6 Hrs.
	(ii) Shoe modifications, principles & procedures in clinical application	4 Hrs.	26 Hrs.
	(iii) Biomechanics of the foot	3 Hrs.	2 Hrs.
2.		Ankle Foot Orthoses K.O. KAFO, EKAFO, GIL, HKAFO	
a. Medical			
	(i) Pathomechanics Lower extremity (including foot, ankle, knee and hip.)	3 Hrs.	-
	(ii) Introduction to Orthotic management	2 Hrs.	2 Hrs.
	(iii) Orthotic prescription	1 Hrs.	4 Hrs.
	(iv) The influence of error in bracing upon deformity of lower extremity	3 Hrs.	6 Hrs.
	(v) Gait training	2 Hrs.	-
b. Technical			
	(i) Lower extremity orthotic components & functions.	6 Hrs.	18 Hrs.
	(ii) Principles of taking measurements, selection of components, fabrication, alignment fitting and check-out of orthoses.	12 Hrs.	168 Hrs.
	(iii) Analysis of Pathological & orthotic gait	5 Hrs.	20 Hrs.
	(iv) Study of publications sources for up-to-date information on lower extremity Orthoses.	1 Hrs.	8 Hrs.
Total		75 Hrs.	268 Hrs.

Reference Books

1. Atlas of Orthoses published By A.A.O.S.
2. Manual of L.E. Orthoses by N.Y. University.

3. Orthosis etcetera by N.Y. University.

Paper X -Spinal Orthotic (216 Hours)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.		(a) Medical	
(i)	Surface of anatomy of trunk	2 Hrs.	-
(ii)	The Physiological basis of Orthotic methods	2 Hrs.	-
(iii)	Orthotic treatment of lumbar & thoracic conditions	10 Hrs.	50 Hrs.
(iv)	Orthotic treatment of cervical condition	6 Hrs.	42 Hrs.
(v)	Spinal Orthotic prescription	2 Hrs.	2 Hrs.
(vi)	The M.W. brace, exercises for users of M.W. Braces, Boston brace.	8Hrs.	54 Hrs.
2		(b) Technical	
(i)	Components of spinal braces.	4 Hrs.	8 Hrs.
(ii)	Bio-mechanics of the spine	3 Hrs.	-
3.	Study of publications for up to date information on orthotics (Spine)	1 Hrs.	10 Hrs.
Total		50 Hrs.	166 Hrs.

Reference Books: -

1. Fundamental principles and treatment of scoliosis - American Academy of Ortho. Surgeon.
2. Spinal Orthotics - N.Y. University
3. Non-operative treatment of scoliosis with M.W. Brace - bY Walter P. Blount M. D. and JoH. Moe, M.D.
4. Manual of Upper Extremity Prosthesis - yy William R. Santchi Dept of Engg, VCLA

Topic- XI**Clinical Meeting / Case Conference, Educational Tour & Dissertation (208 Hours)****Clinical Meeting / Case Conference (70 Hours)**

S.No	Topic Breakdown	Theory (Hrs.)	Lab / Field works (Hrs)
1.	Clinical observation	1 Hrs.	-
2.	Presentation of orthotic fitment cases (lower Ext)	1 Hrs.	16 Hrs.
3.	Presentation of Orthotic fitment cases (upper and spinal)	1 Hrs.	16 Hrs.
4.	Presentation of Lower Extremity Prosthetic cases	1 Hrs.	14 Hrs.
5.	Presentation of Upper Extremity. Prosthetic cases	1 Hrs.	14 Hrs.
Total		10 Hrs.	60 Hrs.

Visit to Manufacturing Units & Other Rehabilitation Centres in the Field of P &O (42 Hours)

Appendix- I
 List of Books in Prosthetics & Orthotic
 I. Lower Extremity Prosthetics

S.No.	Title	Author / Publisher
1.	Lower Extremity Prosthetics (1973)	New York University
2.	The immediate post – operative Prosthesis in L.E. Amputation	Andrew C. Ruoff & Others.
3.	Contribution of L.E. Prosthetics Programme	Edmund M.
4.	Aircushion Socket for Petellar-Tendon Bearing B.K. Prosthesis	L.A. Willson, E. Iyquist and C. Radcliffe.
5.	B.K. Soft socket plastic leg	
6.	Fitting alignment & fabrication of a B.K. Prosthesis	L.F. Iulicucci
7.	Direct Forming of B.K., P.T. B. Socket with tools & materials.	Antony Stros & H.R. Gardner
8.	Bio-mechanics of B.K. Prosthesis	New York University PG Medical Schools
9.	Education programme on fluid	Willam M. Bennstock

Controlling Mechanism for AK Prosthesis		
10.	The snirg phase of Walking with A.K. Prosthesis	V.A. Prosthetic Centre
11.	A.K. Prosthetic: Impression duplication of the Socket	E.F. Murphy (BPR Spring 1964)
12.	A New German Method of aligning A.K. Prosthesis	A.P. Gruman
13.	Adjustable Brim Fitting of above knee (AK) Amputees	J.Froot
14.	A felxible casting Brim Technique for A.K. Socket	Sidney Fishman & others
15.	Elements of training with much SNS – System A.K. Amputees	E.A. Lewis
16.	Use of temporary Prosthesis & Adjustable walking Jig.	C.F. Mealler
17.	A.K. Prosthesis Socket Shape related to Anatomy of Hip & Thigh	Univeristy of California

18.	Functional Consideration in the Fitting of A.K. Prosthesis	C.W. Radcliffe
19.	Above Knee Amputation – Prosthetic Principles & Practice	Zame Grim
20.	Self Energised Power System for A.K. Prosthesis	R. Seliktaw
21.	Problems in the fitting & Services of Prosthetic devices for A.K. Amputees	Arun Setm
22.	B.K. & A.K. Prosthesis	National Academy of Science
II. Upper Extremity Prosthetics		
1.	Upper Extremity Prosthetics	Veteran Adma. N.Y.
2.	Upper Extremity Prosthetics.	North Western University Medical Sector – I
3.	Upper Extremity Prosthetic for Prosthetists	-do
4.	Manipulator & U.E. Prosthetics	National Academy of Science
5.	The use of Low fiction Housing Liner in U.E. Prosthesis	F. Sammons
6.	Cine Plastic Above- Elbow Prosthesis	Thomas J. Canty
7.	Manual of Upper Extremity Prosthetics	Willam R. Santshi Edn.
8.	How to fit Robin Aids partial hand Prosthesis	Miles H. Anderson.
9.	Evaluation of the Heidelberg Pneumatic prosthesis	Luigi Lucaccini & Other
10.	Clinical Evaluation of External Powered Upper Limb Prosthesis	Carol A. Ross.

III. General Prosthesis		
1.	Materials & Tools for Prosthesis	
2.	Maintenance & Care of the Prosthesis	C. A. Hannesseg.
3.	Principles in Prosthetic Management for Multiple Handicapped	E.F. Murphy
4.	April Hook Training Lessons	Sicrra Engineering
5.	A Hemipel tectomy Prosthesis	Fred Hampton

6.	The Limb Deficient Child	Berton Blake
7.	Report of the U.N. Inter –regional seminar on Training Prosthetists	United Nations
8.	Limb Prosthetics – 72	A. Benittoo Wilson
9.	Prosthetics	World Veteran Federat
10.	Muscles Skeletal System	E.F. Murphy
11.	Deigning to Meet the Challenges in Prosthetics	E.F. Murphy
12.	Hip Disarticulation Prosthesis	C.A. Melaucik
13.	The Canadian type of Hip Disarticulation Prosthesis	J.Froot
14.	Casting Hemipelctomy & Hip Disarticulation Prosthesis	V.A. Prosthetic Centre
15.	Evaluation of Total Hip Replacement	D.A. Mc. Grouther.
IV. Lower Extremity Orthotics		
1.	Lower Limb Orthotics Conventional	University of Strathclyde.
2.		Use of External support in the treatment of Low Back Pain.
3.	Selected Lower Limb Anomalico	Goorgo T. Aitken
4.	Workshop Panel on L.E. Orthotics	R.D. Keagy & Orther
5.	Powered Lower Limb Orthotics in Paraplegia	J. Hughoo

V- Upper Extremity Orthotics

1.	Development of Externally powered Upper Extremity orthotics	Bayior University
2.	The strength of hand	A.B. Samson & Orther
3.	Clinical Evaluation of the Engen	Hecter M.Kag
4.		Hand Splint
5.	Development of U.E. Orthotics	T.J Engen
6.		Lumbo–sacral support

VI -Miscellaneous Orthotics

1.	Spinal Orthotics	Rehabilitation Services Administration
2.	Materials & Tools for Orthotics	American Orthotic & Prosthetic Association
3.	Orthotic Services USA	AO & PA
4.	Orthopedic Appliances Atlas	AAOS
5.	The Red Book of Anatomical Support	AAOS
6.	Principles of fracture fixation	Charles O. Bechtul
7.	Orthopedic Corset & Bolts	Veteran Administration
8.	Congenital Limb Deficiency	Charles A. Frank
9.	Orthotic Research & Development	By R.O. Rattily, National Academy of Science
10.	Orthotic Systems & Research	R.N. Scott
11.	The Advance in Orthotics	George Murdon, ED.
12.	Atlas of Orthotics: Bio-Mechanical Principles & Application	Anerical Academy of Ortho. Surgeons.
13.	Orthotic Etcetera	John. E. Redford University
14.	Course on Orthotics	North Western University Medical School
15.	Orthotic Prescription	W.H. Handerson.

The following are important publications on Prosthetic and Orthotic and enquires may kindly be made to them to get the latest catalogues for procurement of books.

1. American Academy of Orthotists & Prosthetists, 717, Pendleton Street, Alexandria – VA 22314.
2. American Orthotic & Prosthetic Association, 717, Pendleton, Street, Alexandria- VA 22314.
3. The Superintendent of Document, US Govt. Printing office, Washington, DC 20402 USA.
4. Prosthetic & Orthotics, New York University P.G. Medical School 317, East 34th Street, New York 10016.
5. National Academy of Science, 2101 Construction Avenue, Washington, DC 20418.

Important Journals dealing in Prosthetics and Orthotics.

S. No.	Title	Editor & Publisher
1.	Journal of Prosthetic and Orthotic International	International Society for Prosthetics and Orthotics. Secretariat: ISPO, Borgervaenge – 5, 2100 Copenhagen,
Denmark		
2.	Clinical Prosthetics and Orthotics	American Academy of Orthotists & Prosthetists, 717 Pendleton Street, Alexandria VA-22314.
3.	Orthotic and Prosthetics	American Orthotic & Prosthetic Association, 717, Pendleton Street Alexandria, Virginia-22314
4.	Inter Clinic Information	Prosthetics & Orthotics, NY University, P.G. Medical School 317, East 34 th Street, New York-10016
5.	The Journal of Rehabilitation in Asia	Editor, W.G. Rama Rao , Hon. Treasurer, ISRH, C/o P.C. Hansotic & Co. 51, M.G. Road, Bombay-400 023
6.	Archives of Physical Medicine and Rehabilitation	Circulation Manger, Archives of Physical Medical & Rehabilitation, 30 N. Michigan Avenue, Secte-992 CHICAGO- Illinois – 60602.

Appendix II

Recommended Staff pattern for conducting two Years Diploma Course in Prosthetic / Orthotics.

1. Professor & Head of the Deptt. of Prosthetics / Orthotics. 1 (As per UGC or C.G. Scales).
2. Asstt. Professors in Prosthetics/ Orthotics 2 – (do)
3. Lecturers in Prosthetics / Orthotics 2 – (do)
4. Asstt. Lecturers in Prosthetics Orthotics 9 (2 Full time & 7 Part time.)
 1. Technical Drawing (Full Time)
 2. Rehabilitation & Psychology (Part-Time)
 3. Anatomy (Part-Time)
 4. Physiology (Part-Time)
 5. Pathology (Part-Time)
 6. Orthopaedics (Part-Time)
 7. Amputation Surgery (Part-Time)
 8. Workshop Technology materials tools, and equipment (Full time)
 - *9. Applied Mech. and Stores of Materials (To be taken by Asstt. Prof.)
 - *10 Kinesiology & Bio-Mechanics (To be taken by Prof.)
 - *11 Electronics & Bio-electricity, (To be taken by Asstt. Prof.)
5. Instructors in Prosthetics / Orthotics 15 (1:4) ratio.
6. Instructors in Surgical shoes / Leather work..... 4
(Ministerial Staff & Others not included.)