

DIPLOMA COURSE

IN

PROSTHETICS &

ORTHOTICS

SYLLABUS OF

• DIPLOMA IN

PROSTHETICS & ORTHOTICS

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DIPLOMA IN PROSTHETICS & ORTHOTICS

1 Structure of the Course

1.1 (a) General Objective

The principle objectives of the course is the training of men and women as Prosthetists and Orthotists to meet the growing requirement for, well qualified personnel competent to undertake this very specialized type of work in the country.

Prosthetist/ Orthotist technician 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 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 Prosthetists/ Orthotists qualified to work with Physicians, Therapists and other professionals in the field of Rehabilitation in the clinical environment.

The candidates so trained should be bright, intelligent, clean-cut able to think, solve problems and apply basic principles in their work. Aiming at these objectives 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 Prosthetic and Orthotic shop practices and learn the fundamentals of manufacturing, measuring and fitting of appliances.

This is followed by more advanced studies in basic subjects and under direction and supervision and the students design, fabricate and fit prosthetic or orthotic appliances, as the case may be, and attend clinical meeting/conferences, demonstrations and seminars. Coaching in shop management and administration is also given to prepare them to hold such responsibilities.

1.2. Entry requirements

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

- b. A pass in the 10+2 in the vocational stream in the trade of machinist or 10+2 and I.T.I. Certificate in the trade of Fitter / Turner / Machinist / Tool or Die Maker.
- c. 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. Length of the course

The course duration is Two Years followed by Internship of Six Months in any recognized Rehabilitation / Limb Fitting Centres.

2. Courses Organization

A General

2.1 A. Teachers:

- a. For teachers taking up lectures on medical subjects, a minimum qualification of M.B.B.S. preferably trained in Physical Medicine & Rehabilitation or in Prosthetics and Orthotics (Short Orientation Course) or an Orthopaedic Surgeon with minimum 3 years experience.
- b. For teachers taking up lectures on Bio-mechanics, Prosthetics and Orthotics a minimum qualification of a graduate in the subject and 2 years experience is preferable. In the absence of such personnel, teachers with diploma in prosthetics and orthotics with outstanding practical and or teaching experience for not less than 5 year will be required.
- c. For practical demonstration in prosthetics / orthotics and supervision, Prosthetists / Orthotists with a diploma and not less than 3 years experience in practical will be required.

2.2 Students–Teacher Ratio

- a. For medical subjects, one full-time or part-time lecturer on each subject for a batch of maximum 20 students is considered adequate.
- b. For theory classes in Bio-mechanics and subjects on prosthetic and orthotics, one lecturer in each subject will be required for a batch of 20 students (max.).
- c. For practical demonstration and supervision and guidance of students in laboratory practices in prosthetics and orthotics, a ratio of teacher versus students should be 1:4 for very close attention of the instructor on each student and patients as well.

2.4 Teaching Methods

- a. Theory lectures should be accompanied by notes / précis given to students wherever possible on the subjects covered. Study manuals are to be prepared on each subject and are to be provided to students. Wherever possible visual aids like slides, epaediastroscope, overheads projector etc. are to be used for the students to understand and grasp the subjects better.
- b. Lectures should include practical demonstration, group discussions. For medical subjects, visits to anatomy department / pathological museum / operation theatres in a medical institution are to be arranged for the students to have visual experience and learning.
- c. Practical work in prosthetics / orthotics and clinical practice must be given to the students under experienced faculty members.
- d. “Basic ideas and principles of Instruction” given on page No. 7 may be followed.
- e. Visits to manufacturing unit of prosthetic / orthotic and major limb fitting centers are to be arranged for the students. Field work in rehabilitation including rural and tribal areas may be arranged for the benefit of students to expose themselves in practical rehabilitation work (during their internship).

3. Examinations

A. Preliminary Assessment

Candidates who possess the minimum entry qualifications and applied for undergoing the course will be interviewed by an Entrance Examination Board consisting of a Physician (Ortho. Surgeon or Physiatriest), a Bio-engineer (Prosthetist / Orthotist), a psychologist or a vocational guidance expert to assess the aptitude, ability and suitability of the students to continue the course. A maximum of 100 marks will be set apart for this assessment. A minimum of 50% marks is necessary for a candidate to admission in this assessment test (45% for reserved category).

A 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 by an Examining board.

$$\text{Average percentage for selection for admission} = \frac{A+B}{2}$$

The assessment for SC / ST candidates will be made separately in the same manner as above, and a separate list in the order of merit will be prepared for them and seats will be allotted as per the reserved quota.

B. Final Evaluation

Examinations in theory / practical will be conducted at the end of each semester. 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%.

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
Paper1	Life/basic science <ul style="list-style-type: none"> • Anatomy • Physiology • Pathology 	65 55 45	45 35	3	250	200
Paper2	Workshop technology & practice Technical drawing	153 119	-	4	276	200
Paper3	Applied mechanics & strength of materials Electronics and Bioelectricity	114 35	-	3	224	100
Paper4	Orthopaedics, Amputation surgery Kinesiology & Biomechanics	107+ 84+16	-	3	194	200
Paper5	Prosthetic L.E	100	383	3+6 (p)	492	100(Th) 100(P)
Paper6	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 Hrs	Practical hours	Exam hrs	Total hrs	Exam marks
Paper7	Introduction to PMR, Rehab Psychology, Workshop admn.& management	150	-	3	150	100
Paper8	Prosthetic U.E	100	267	3+6 (P)	367	100(Th) 100(P)
Paper9	Orthotic U.E	50	114	3+6 (P)	225	100(Th) 100(p)
Paper10	Spinal orthotic	100	166	3+6 (P)	225	100(Th) 100(p)
Paper11	Case conference, educational tour & dissertation	-	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
Anatomy

Life/Basic Science

(250 Hours)
(92hrs)

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.	Myology – 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, antecubital 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. B.D. Chaurasia

Physiology

(80hrs)

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.

Pathology

(75hrs)

S.No	Topic Breakdown	Theory (Hrs.)	Lab / Field works (Hrs)
1.	Introduction to pathology, General pathology	3 Hrs.	-
2.	Inflammation – signs and symptoms – types of inflammation, Acute & Chronic inflammation	10 Hrs.	4 Hrs.
3.	Infections – Bacteria and viruses, immunity, types, classification, control of infection, cross infection & prevention. Asopsis and sterilization, pyogenic	10 Hrs.	6 Hrs.

	infection – boils, abscess setticamla, Tuberculous infection of bones & joints & management. Fungle infection – actiriomycosis, filariasis, leprosy, veneral disease syphilis, gonorrohea, virus infection – poliomyelitis influence.		
4.	Wounds – types of healing process.	10 Hrs.	4 Hrs.
5.	Tumours – connected to bones		
6.	Vascular disorders- Thrombosis, Embolism, Thrombo angites, Obliterands. Arthrosclerosis, hyper lesions.		
7.	Gangrene – types, causes, signs & symptoms and management.	10 Hrs.	4 Hrs.
8.	Metabolic disorders – Diabetes, Rickets, Hyper & Hypo-para throidesm & parathyroidism, metabolic disorders – Osteoporosis	8 hrs	
9.	Inflammation of joints – Arthritis – classification and pathology	10 Hrs.	4 Hrs.
Total		53 Hrs	22 Hrs

Paper II

Workshop Technology & Practice & Technical Drawing

(272 hrs)

Workshop Technology

(153hrs)

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 & tranmmels, feeler & surface gauges, etc.	6 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.	4 Hrs.	2 Hrs.
5.	Forging (blacksmithy) -the forge & tools used in smithy & forging processes.	2 Hrs.	1Hrs.
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.	7 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.	6 Hrs.	6 Hrs.
8.	Milling types of milling machines, Milling cutter, Up-cut & cone cut milling dividing head, set-up and operation on milling machine	7 Hrs.	6 Hrs.
9.	Shaping – Shaping machine and their use.	2 Hrs.	2 Hrs.
10.	Grinding – The grinding wheels, abrasives, wheel bends, grit & grade, wheel structure, shape, selection, hand grinders, speed & feed, types of grinding & different types of grinding machines.	7 Hrs.	6 Hrs.
11.	Finishing process polishing, buffing, electroplating, copper, nickel and chromium.	Hrs.	6 Hrs.
12.	Material & Tools used in Prosthetics & Orthotics; - a. Rubber different types uses, density, resilience, utility in prosthetic & orthotic	5 hrs	-
	b. Plastics-types, strength impregnation, lamination colouring & utility:	8 hrs	8 hrs
	c. Ferrous metals – Steel variety & uses	4 Hrs.	8 hrs
	d. Non-ferrous metals and alloys, aluminum,	6 hrs	-
	e. Fabrics	2 hrs	1 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.	3 hrs
	Total	96 hrs.	57 hrs

Reference Books: -

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

Technical Drawing

(119 hrs)

S.No.	Topic Breakdown	Theory (Hrs)	Practical / Field work (Hrs.)
1.	Introduction to Engineering Drawing	1 Hrs.	-
2.	Definition, terms & uses	2 Hrs.	4 Hrs.
3.	Printing letters		
4.	Lines, angles, triangles and quadrilaterals.	1 Hrs.	4 Hrs.
5.	Circles and Tangents	1 Hrs.	2 Hrs.
6.	Regular polygone	1 Hrs.	6 Hrs.
7.	Ellipse, Cycloid involute of circles	2 Hrs.	4 Hrs.
8.	Orthographic projections, Plan, Elevation, Side view.	3 Hrs.	10 Hrs.

9.	Projections of points, lines & solids (Prisms, Pyramid Cylinders & Cones), including simple case of projections on oblique planes.	2 Hrs.	6 Hrs.
10.	Projections in oblique planes, auxiliary planes & views.	2 Hrs.	4 Hrs.
11.	First & third angle method	1 Hrs.	5 Hrs.
12.	Full & sectional view of machine parts.	1 Hrs.	3 Hrs.
13.	Dimensioning the views, conventions used in view.	1 Hrs.	3 Hrs.
14.	Drawing of principle components, parts like bolts, nuts rivets, keys, locking pins, washers etc.	2 Hrs.	7 Hrs.
15.	Joints & coupling, rivetted, bolted, keyed, knuckle joints.	3 Hrs.	8 Hrs.
16.	Conventions in technical drawing.	2 Hrs.	5 Hrs.
17.	Isometric view of simple objects.	1 Hrs.	9 Hrs.
18.	Practice in hand sketches, line drawing, various prostheses, orthoses & the Rehab. aids	1 Hrs.	12 Hrs.
19.	Total	27 Hrs.	92 Hrs.

Reference Books: -

1. A Text book of Engineering Drawing by R.B. Gupta
2. A Text book of Geometrical Drawing by R.K. Gupta

(Katsan Publishing Co.)

Paper III

Applied Mechanics & Strength of Material & Electronics & Bio-Electricity (221 hrs)

Applied Mechanics & Strength of Material (114 hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
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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. – stress strain curve, statement of formulae relating between different moduli-simple problems to understand the above principles of composite bars – formula relating to loads & strains in individual members – simple problems to understand the above relations.	15 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, trapezoidal section. Determination of common centroid for a combination of two circles – simple statement of formulas for regular section namely Rectangle, Triangle & Circle, parallel axis & perpendicular axis theorem	6 Hrs.	1 Hrs.
3.	Shear Force & Bending moments Classification of beams, types of loads, definition of shear force & bending moment of a loaded beam, shear force & bending moment diagrams for cantilevers and simply supported beams with concentrated UDL loads - simple problems to determine SF and BM at various points and draw SF and BM diagrams.	13 Hrs.	2 Hrs.
4.	Theory of simple bending Definition of bending stress, neutral axis, moment of resistance fiber stress etc. assumption to be absorbed in the simple bending theory. Derivation of the equation of simple bending. Simple problem of cantilever and simply supported beams with central concentrated load & full load.	10 Hrs.	2 Hrs.
5.	Torsion Definition of torsion, angle of twist, polar moment of inertia etc. assumption made in torsion, statement of torsion equation, simple problems to determine transmitted in solids & shafts only.	6 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.	6 Hrs.	1 Hrs.
7.	Riveted Joints Types of riveted joints, strength of joints, Howin's formula – simple problems in	10 Hrs.	2 Hrs.

	single rivetted & double rivetted lap & butt joints, to determine pitch & efficiency of the joints.		
8.	Thin cylinders Failure of thin cylinders, longitudinal & hoop stresses assumptions, derivation of formulae, simple problem.	6 Hrs.	1 Hrs.
9.	Friction Principles of friction – co-efficient of, definition of static &	8 Hrs.	1 Hrs.

Electronics & Bio-Electricity

(107 hrs)

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	24 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.	21 Hrs.	14 Hrs.
3.	Bio-Electricity Biological potentials, muscle action potentials, electromyography, myoelectricity control of artificial arms, Bio-cybernetics.	24 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.

Paper- IV

Orthopaedics, Amputation Surger & Kinesiology & Bio-mechanics

(191hrs)

Orthopaedics

(69hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Introduction to Orthopaedics	1 Hrs.	-

2.	Principles of Orthopaedics	1 Hrs.	-
3.	Congenital deformities	3 Hrs	-
4.	Diseases of Nervous System	4 Hrs.	-
5.	Poliomyelitis	3 Hrs.	-
6.	Obstetrical paralysis	1 Hrs.	-
7.	Spastic paralysis	2 Hrs.	-
8.	Hemiplegia	2 Hrs.	-
9.	Paraplegia	3 Hrs.	-
10.	Pyoenic infection	2 Hrs.	-
11.	Tuberculosis	2 Hrs.	-
12.	Leprosy	3 Hrs.	-
13.	Chronic arthritis	2 Hrs.	-
14.	Rheumatoid arthritis	3 Hrs.	-
15.	Osteoarthritis	3 Hrs.	-
16.	Neuropathic arthritis	3 Hrs.	-
17.	Metabolic diseases	3 Hrs.	-
18.	Rickets	3 Hrs.	-
19.	Avitaminosis	2 Hrs.	-

20.	Renal osteo-distrophy	2 Hrs.	-
21.	Bone tumours	3 hrs.	-
22.	Trauma	3 Hrs.	-
23.	Fractures upper extremity	3 Hrs.	-
24.	Fracture lower extremity	3 Hrs.	-
25.	Spine dislocation	3 Hrs.	-
26.	Management of fracture	3 Hrs,	3 Hrs.
Total		66 hrs.	3 Hrs.

Reference books

Essential of orthopaedics – J. Maheshwari

Amputation

(38 hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field works (Hrs)
1.	Introduction to amputation surgery – indications	1 Hrs.	-
2.	Principles of amputation, types, techniques.	4 Hrs.	-
3.	Amputation in children (Upper & Lower Extremity)	3 Hrs.	-
4.	Amputation in adults (Upper extremity) and its complications (various levels)	3 Hrs.	-
5.	Amputation in lower extremity & its complications (various levels)	3 Hrs.	-
6.	Postoperative care of the stump properties of good stump.	4 Hrs.	-

7.	Examination & prescription	1 Hrs.	-
8.	Stump dermatology	2 Hrs.	-
9.	Common skin diseases and their management	2 Hrs.	-
10.	Stump hygiene	1 Hrs.	-
11.	Latest techniques of amputation Myodesis – Myoplasty	4 Hrs.	-
12.	Immediate post-operative fitting or prosthesis for lower extremity amputation	4 hrs.	6 Hrs.
Total		32 Hrs.	6 hrs.

Kinesiology & Biomechanics**(84hrs)**

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Definition of Kinesiology & Bio-mechanics	1 Hrs.	-
2.	Diagram & Bio-mechanics	4 Hrs.	1 Hr.
3.	Origin & Development of Kinesiology	1 Hrs.	-
4.	Definition of Kinetics & Kinematics	4 Hrs.	1 Hr.
5.	Centre of gravity of human body.	2 Hrs.	1 Hrs.
6.	Segment masses & the density of parts.	3 Hrs.	1 Hrs.
7.	The whole body centres of gravity.	2 Hrs.	1 Hrs.
8.	Segment of centres of gravity	3 Hrs.	1 Hrs.
9.	Origin of human movements & its significance	2 Hrs.	1 Hrs.
10.	Forms of human movement their characteristics & factors affecting them.	3 Hrs.	1 Hrs.
11.	Analysis of movement.	3 Hrs.	1 Hrs.
12.	Body links and motion of parts.	2 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.	Electrogenio-metric method	3 Hrs.	1 Hrs.
18.	Mechanics of the spine	3 Hrs.	1 Hrs.
19.	Lumbar discometry	2 Hrs.	1 Hrs.
20.	Locomotor studies	7 Hrs.	2 Hrs.
21.	Bio-mechanics of lower extremity	4 Hrs.	1 Hr.
22.	Bio-mechanics of upper extremity	4 Hrs.	1 Hr.
23.	Gait analysis	4 Hrs.	2 Hrs.
24.	Bio-mechanics of squatting	2 Hrs.	-
Total		64 Hrs.	20 Hrs

Paper vi

Prosthetic (lower limb)

(483 hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1. Medical subjects			
(i)	Levels of amputation & limiting factor (lower extremity)	3 Hrs.	-
(ii)	Psychological aspects of amputation	2 Hrs.	-
(iii)	Classification of congenital skeletal limb deficiencies.	2 Hrs.	-
(iv)	Prosthetic / Orthotic clinic procedures	2 Hrs.	2 Hrs.
(v)	Prosthetic prescription	1 Hrs.	1 Hrs
(vi)	Immediate & early Prosthetic management	3 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.	35 Hrs.	240 Hrs.
(iii)	Gait analysis of BK/ AK amputees fitted with prostheses.	3 Hrs.	6 Hrs.
(iv)	Check out of below knee & above knee prosthesis	3 Hrs.	8 Hrs.
(v)	Maintenance & care of prosthesis	2 Hrs.	1 Hrs
		6 Hrs.	70 Hrs.

(vi) Hip disarticulation & Hemipelvectomy prosthesis		
(vii) Bio-mechanics of below knee, above knee & hip disarticulation prosthesis	16 Hrs.	1HRS
(viii) Fluid controlled prosthesis	2 Hrs.	2 Hrs.
(ix) Modular & other modern types of prosthesis	8 Hrs.	10 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	4 Hrs.	4 Hrs.
Total	100 Hrs.	383 Hrs.

Paper vii

Orthotic (lower extremity)

(343hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Foot orthosis		
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	7 Hrs.	6 Hrs.
	(ii) Shoe modifications, principles & procedures in clinical application	6 Hrs.	26 Hrs.

(iii) Biomechanics of the foot	4 Hrs.	2 Hrs.
2.AFO,KO,KAFO,HKAFO,etc.		
a. Medical		
(i) Pathomechanics Lower extremity (including foot, ankle, knee and hip.)	6 Hrs.	-
(ii) Introduction to Orthotic management	2 Hrs.	2 Hrs.
(iii) Orthotic prescription	2 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.	10 Hrs.	18 Hrs.
(ii) Principles of taking measurements, selection of components, fabrication, alignment fitting and check-out of orthoses.	15 Hrs.	168 Hrs.
(iii) Analysis of Pathological & orthotic gait	8 Hrs.	20 Hrs.
(iv) Study of publications sources for up-to-date information on lower extremity Orthoses.	3 Hrs.	8 Hrs.
Total	75 Hrs.	268 Hrs.

Reference book

Atlas of orthotics

2ND Year

Paper vii

P.M.R. & Introduction to Rehabilitation & Psychology & Workshop Administration & Management (182 hrs)

P.M.R

(83 hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
1.	Introduction to Physical Medicine & Rehabilitation.	1Hrs.	-
2.	Muscle charting	10 Hrs.	8 Hrs.
3.	Electro-therapy	7 Hrs.	6 Hrs.
4.	Hydro-therapy	2 Hrs.	1 Hrs.
5.	Application of the above topics in the management of amputees	2 Hrs.	2 Hrs.
6.	Neuro muscular diseases type and management	7 Hrs.	2 Hrs.
7.	Arthritis, types and management	4 Hrs.	2 Hrs.
8.	Crutches & uses, different crutches-gait	4 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	10 Hrs	6 Hrs.
11.	Prescription of appliances.	1 Hrs.	-
Total		50 Hrs.	33 Hrs.

Introduction to the Course, Rehabilitation & Psychological Aspects

(29hrs)

- **Introduction to the subject**
- Visit to various department of the institution.
- General ideas and definition of prosthetic&orthotics
- Function of the different department of the institute
- Rehabilitation :-
 - concept of rehabilitation
 - total rehabilitation
 - rehab. Team &role of each members.

Psychology of disabled a. Goals & methods of scientific psychology
b. Normal personality, normal growth & development c. Heredity d. Maturation
e. Environment & Learning factors in intellectual & Social Development.
f. Psychometry g. Testing & motivation h Emotional life of the disabled & psychological assessment
i. Counselling
Social & Vocational Aspects
a. Disability & social effects b. Home environment of disabled
c. Attitude of the society d. Vocational problems
e. Vocational assessment

f. Vocational counselling and guidance

g. Follow up

Workshop Administration & Management

(70hrs)

1.	Planning of Prosthetic / Orthotic Workshop Workshop layout organization of department / sections, location of various departments, types of construction & ventilation & lighting provision for further extension, sanitary convenience, plant layout & main objects of scientific layout.
2.	Administrative & Management structure.
3.	Industrial Management Definition of organisation, Administration & Management Principles of good organization, type of organization charts.
4.	Selection & Training
5.	Foremanship & Duties of formen & qualities of formen
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.
7.	Purchase Organisation Functions of purchase department, methods of purchasing, purchase procedures.
8.	Cost Accounting Closing of job cards and work orders
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
10.	First Aid Wounds, antiseptics, bandages, splints, and their practical uses, care of injured cares
	Practical demonstration of handling the casualties of various types.
	Artificial respiration, practical demonstration
	Practical demonstration or external cardiac message.
	Treatment of shoe

Paper viii

Prosthetic (upper extremity)

(337hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work (Hrs)
	1. medical subjects		
	(i) Classification by level of amputation.		-
	(ii) Medical consideration applied anatomy and pathological consideration	3 Hrs.	-
	(iii) Classification of congenital skeletal limb deficiencies	3 Hrs.	2 Hrs.
	(iv) Prosthetic prescription	2 Hrs.	1Hrs.
	(v) Amputee trainee	2 Hrs.	2 Hrs.

2. technical		
(i) Components of upper extremity prostheses, control & harness systems.	6 Hrs.	8 Hrs.
(ii) Fabrication principle & procedures for upper extremity prostheses.	6 Hrs.	72 Hrs.
(iii) Measurement fitting & alignment	6 Hrs.	36 Hrs.
(iv) Check-out & care of B.E. prostheses.	4 Hrs.	22 Hrs.
(v) Bio-mechanics of U.E. prostheses.	6 Hrs.	10 Hrs.
(vi) Harness & control systems Below Elbow harnessing & this causes, shoulder amputee harnessing.	10 Hrs.	28 Hrs.
(vii) Clinical aspects of U.E. prosthesis	4 Hrs.	24 Hrs.
(viii) Training in the use of U.E. prosthesis	4 Hrs.	24 Hrs.
(ix) Electro-mechanical myoelectric and other externally powered prostheses	8 Hrs.	28 Hrs.
(x) Study of publication sources for updating information on upper limb prostheses	4 Hrs.	12 Hrs.
Total	70 Hrs.	267 Hrs.

Paper ix

Orthotic (upper extremity)

(154hrs)

S.No.	Topic Breakdown	Theory (Hrs.)	Lab / Field work(Hrs)
1. a Medical subjects			
	(i) Functional anatomy of the hand	4 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	22 Hrs.	98 Hrs.
3.	Biomechanics of functional hand splints and arm Orthosis	12 Hrs.	10 Hrs.
Total		40 Hrs.	114 Hrs.

Paper X

Spinal orthotic

(216hrs)

S.NO.	Topic Breakdown	Theory (hrs)	Lab/field work (hrs)
1.	Medical		
	(i) Surface of anatomy of trunk	2hrs	-
	(ii) The Physiological basis of Orthotic methods	3hrs	-

	(iii) Orthotic treatment of lumbar & thoracic conditions	12hrs	50hrs
	(iv) Orthotic treatment of cervical condition	10hrs	42hrs
	(v) Spinal Orthotic prescription	2hrs	2hrs
	(vi) The M.W. brace, exercises for users of M.W. Braces, Boston brace.	11hrs	54hrs
2	b Technical		
	(i) Components of spinal braces.	4hrs	8hrs
	(ii) Bio-mechanics of the spine	4hrs	-
3.	Study of publications for up to date information on orthotics (Spine)	2hrs	10hrs
	Total	50hrs	166hrs

Reference book

- **Spinal orthotic - NY University**
- **Fundamental principles & treatment of scoliosis**

Topic xi

Clinical Meeting / Case Conference, Educational Tour & Dissertation (208hrs)

Clinical Meeting / Case Conference (70hrs)

S.NO.	Topic Breakdown	Theory (hrs)	Lab/field (hrs)
1.	Clinical observation	2hrs	-
2.	Presentation of orthotic fitment cases(lower limb)	2hrs	16hrs
3.	Presentation of orthotic fitment cases (upper &spinal)	2hrs	16hrs
4.	Presentation of upper extremity prosthetic cases	2hrs	14hrs
5.	Presentation of lower extremity prosthetic cases	2hrs	14hrs
	Total	10hrs	60hrs

Visit to Manufacturing Units & Other Rehabilitation Centres (96hrs)

S.NO.	Topic Breakdown
	Visits to ALMICO, Kanpur, Visit to Bombay Pune, Madras, Cuttack and New Delhi, Major limb fitting centres.

Dissertation (42hrs)

S.NO.	Topic Breakdown	Theory (hrs)	Lab/field work (hrs)
1.	Choosing of topic for dissertation, preparation of paper & presentation	4hrs	38hrs