

Curriculum Framework

Master in Prosthetics and Orthotics (M.P.O.)

Norms, Regulations & Course Content

Effective from Academic Session 2019-20
Two Years Duration (Annual)



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Master of Prosthetics and Orthotics (M.P.O.) Programme¹

I. PREAMBLE

The prime concern of the Council is to develop patterns of teaching in undergraduate and postgraduate prosthetics and orthotics education so as to demonstrate a high standard of prosthetics and orthotics education to all colleges / institutions in India. This educational experience is imparted in an atmosphere of research. Prosthetics and Orthotics is a specialized health care profession, which combines a unique blend of clinical and technical skills. The Prosthetics and Orthotics Professionals assess and evaluate patients, prescribe, custom design, fabricate, and fit the orthoses and prostheses. Rehabilitation of persons with locomotor disabilities or neuromuscular disorder is a team work, where Centre of attention is the person with disabilities. This work requires substantial clinical and technical judgment. Prosthetics and Orthotics Professional does not only provide service to persons with neuromusculoskeletal disorder and persons with disability, but also it provides service to general health and work related disorder such as foot disorders, fracture, sports injuries, disorders due to aging, tendinitis, muscular pain etc.. Prosthetics and Orthotics Professionals play an important role in the comprehensive post surgical management of amputee and other neuromusculoskeletal disorders. Prosthetics and Orthotics Professionals make the patient independent, confident and useful member of the society through comprehensive prosthetic and orthotic management

II. OBJECTIVES

1. Patient Care

At the end of the MPO Course, the candidates shall be able to

- (1) Assess, prescribe and provide comprehensive prosthetic and orthotic management to the individual and the community appropriate to his/her position as a member of the health care team.
- (2) Be competent to take preventive, supportive, corrective and rehabilitative steps in respect to the commonly encountered problems related to prosthetics and orthotics.
- (3) To carry out Evidence Based Practice in prosthetics and orthotics
- (4) Appreciate the psycho-social, cultural, economic, and environmental factors affecting health, and develop humane attitude towards the patients/relatives, in discharging one's professional responsibilities
- (5) Be familiar with the various National policies and Acts related to Persons with Disabilities.
- (6) Acquire basic management & administrative skills in the areas of materials, financial and human resources related to prosthetics and orthotics

- (7) Develop the communication skills to establish effective communication with the stake holders
- (8) Practice prosthetics & orthotics ethics in patient care, service delivery, and research.
- (9) Develop attitude for self-learning and acquire necessary skills including the use of appropriate technologies.

2. Research

The candidate should be able to

- (a) Recognize a research problem.
- (b) State the objectives in terms of what is expected to be achieved in the end.
- (c) Plan a rational approach with full awareness of the statistical validity.
- (d) Spell out the methodology and carry out most of the technical procedures required for the study.
- (e) Accurately and objectively record on systematic lines the results and observations made.
- (f) Analyze the data using appropriate statistical approach.
- (g) Interpret the observations in the light of existing knowledge and highlight in what ways the study has advanced existing knowledge on the subject and what remains to be done.
- (h) Draw conclusions which should be reached by logical deduction and he / she should be able to assess evidence both as to its reliability and its relevance.
- (i) Write a thesis in accordance with the prescribed instructions.
- (j) Be familiar with the ethical aspects of research.

3. Teaching

He/ she should be able to plan educational programs in Prosthetics and Orthotics in association with his senior colleagues and be familiar with the modern methods of teaching and evaluation.

The candidate should be able to :-

- (a) Deliver lectures to undergraduates and hold clinical demonstrations for them.
- (b) Write and discuss a seminar or a symposium and critically discuss it with his colleagues and juniors.
- (c) Methodically summarize internationally published articles according to prescribed instructions and critically evaluate and discuss each selected article.

(d) Present cases at clinical conference, discuss them with his colleagues and guide his juniors in groups in evaluation and discussion of these cases.

III Nomenclature: Master of Prosthetics & orthotics (MPO)

IV Admission criteria: BPO/ B. Sc (P&O) degree or equivalent from any recognized University in India with minimum 50% marks.

V Medium of instruction: English

VI Duration of the course: Two academic years

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

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

IX Criteria of passing: As per university rules.

X 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.

XI 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.

XII Scheme of Examination: As per University rules.

XIII Dissertation

In the first year the students have to prepare the Research proposal (Synopsis) and present the same in the Seminar/Ethics committee for approval at the end of the first year.

In the 2nd 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.

XIV Scheme of Instruction:

- a) There shall be a University examination at the end of each year. The duration of the theory exam is 3 hours.
- b) Every theory question paper shall ordinarily consist of five questions with one question for each unit, subject to the concerned universities regulation.
- c) 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.
- d) 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.
- e) 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.
- f) 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.
- g) In case of repeat test/seminar to candidates who absented themselves, matter may be dealt as per University norms.
- h) 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.

XV Practical's

At the end of 1st and 2nd years internal viva voice exam will be carried out for award of internal assessment for clinical work performed throughout the year.

XVI Board of Examiners, Valuation:

- a) There shall be a Board of Examiners for scrutinizing and approving the question papers and scheme of valuation or as per University rules.
- b) 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.
- c) 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.
- d) 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.
- e) Grace marks to the candidate will be awarded based on University rules.

XVII Classification of Successful Candidates: As per rules of the respective universities.

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

XVIII Provision for Repeaters

The provision will be as per the concerned university regulations.

XIX 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.

XX. FACULTY-STUDENT RATIO

The faculty-student ratio in the area of M.P.O should be 1:6.

XXI. MPO TEACHING FACULTY NORMS:

Senior faculty in the discipline of Prosthetics and Orthotics shall be considered as course coordinator. The coordinator should be the controlling and informant authority for the correspondence related to the MPO program. He/she should hold qualification as laid down by RCI.

STAFF REQUIREMENT

Sl. No.	Core Faculty	Column-I Upto10 seats	Column-II 11-20 seats
1.	Professor & Head Department of Prosthetics & Orthotics	01 01	
2.	Associate Professors (Prosthetics & Orthotics)	01 02	
3.	Assistant Professor (Prosthetics & Orthotics)	02 03	
4.	Prosthetist and Orthotist/ Demonstrator (P &O)	04 06	

QUALIFICATION & EXPERIENCE OF THE CORE FACULTY

(Valid until the revision of curriculum)

S. N.	DESIGNATION	QUALIFICATION & EXPERIENCE	PUBLICATION	PAY SCALE
1.	Professor	Master in Prosthetics & Orthotics from an institution with a minimum of 10 years of teaching and research experience as Associate Professor (Prosthetic & Orthotic) Desirable: PhD in Prosthetics & Orthotics	Essential 05 publications	As per UGC norms
2.	Associate Professor (Prosthetics & Orthotics)	Master in Prosthetics & Orthotics & Orthotics with 05 years of teaching experience as a Assistant Professor /	Essential 03 publications	As per UGC norms

		Lecturer (Prosthetics & Orthotics) in any recognized Prosthetic & Orthotic Institution Desirable: PhD in Prosthetics & Orthotics		
3.	Assistant Professor (Prosthetics & Orthotics)	Master in Prosthetics & Orthotics with 02 year experience in the field		As per UGC norms -
4.	Prosthetist & Orthotist/ Demonstrator (P &O)	Master in Prosthetics & Orthotics or Bachelor in Prosthetics and Orthotics) with 02 year experience in the field		

NOTE:

1. There shall be only three designations in respect of teachers in universities and colleges, namely, Assistant Professors, Associate Professors and Professors.
2. The pay of teachers and equivalent positions in Technical institutions shall be fixed according to their designations in two pay bands of Rs. 15600-39100 and Rs. 37400-67000 with appropriate " Grade Pay"
3. The ratio of Professors to Associate Professors to Assistant Professors in a UG College shall be in the ratio, ordinarily of 1:2:6. The ratio of Professors to Associate Professors or Assistant Professor in a PG College shall be in the ratio ordinarily of 1:2
4. Minimum qualification for Assistant Professor should be Master in Prosthetics and Orthotics.
5. Assistant Professors possessing Master's degree in prosthetics and orthotics shall be eligible for the GP of Rs. 7600 after completion of 5 years' service as Assistant Professor i.e. to the rank of Associate Professor.
6. Assistant Professors with completed service of 5 years at the GP of Rs. 7600 shall be eligible to move up to the GP of Rs. 8700/
7. Minimum of 2 teaching faculty members in core areas will be required for giving recognition for the first year.
8. Before the commencement of second academic year one more Faculty member must be appointed.
9. In case of Professor not being available, 2 Readers/Associate Professors (additional) should be appointed to accommodate teaching, research guidance and administrative work.

GUEST/PART TIME FACULTY

Lecturers in the following disciplines

Mechatronics

Research Methodology and Biostatistics

Pedagogy in P&O Education & Administration, Management & Ethical Issues

XXII 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.

XXIII INFRASTRUCTURAL REQUIREMENTS

PHYSICAL FACILITIES:

The Institute / College/ University should have separate department and academic block constructed in about 1000 square meters. Adequate hostel accommodation for students should be available in addition to the above mentioned built up area of the BPO course.

Details of the constructed area given below are for the intake capacity up to 20 students:

S.No.	Name	Minimum size in Sq.Ft.
1.	CLASS ROOMS (04 NUMBERS)with LCD projector	02 @ 300 = 600
2.	One room for clinical meeting	600
3.	Two trial fitting rooms (One for men & one for women)	02@ 300 = 600
4.	Two measurement rooms (One for men & one for women)	02@ 200 = 400
5.	Prosthetics Science Lab	1050
6.	One orthotic Science Lab	1050
7.	Prosthetics & Orthotics faculty rooms (Minimum 06)	06@ 100 = 600
8.	Two students common room (One for male & one for female students)	1200
9.	One Office Room	150
10.	One course coordinator room	200

11.	Computer Laboratory Room	600
12.	Two Machinery Room	500
13	One Store room	1350
14.	Gait training Laboratory	450
15	One Plaster room	400
16	Waiting room for the patients	1350
17	Adequate hostel facility	
18	Reception & patient registration	400s
19	Common Multi-Purpose Hall (optional)	2000

Note:

1. The above mentioned space shall be used only for Prosthetics & Orthotics training only.

2. Class rooms

There should be at least four classrooms with the capacity of accommodating the number of students admitted in each class. The rooms should be well ventilated with proper lighting system. There should be built in LCD projector/White Boards. Also there should be a desk/a big table and a chair for the teacher and Racks /cupboards for keeping teaching aids or any other equipment needed for the conduct of classes.

Library

There should be a separate library in the Institute / College/ University. It should be easily accessible to the teaching faculty and the students. It should have comfortable seating arrangements for half of the total strength of the students and teachers in the school. There should be separate budget for the library. The library committee should meet regularly for keeping the library updated with current books, journals and other literature. Internet facility should be provided in the library and to the faculty. The library should have proper lighting facilities and it should be well-ventilated. It should have a cabin for librarian with intercom phone facility. There should be sufficient number of cupboards, books shelves and racks with glass doors for proper and safe storage of books, magazines, journals, newspapers and other literature. There should be provision for catalogue-cabinets, racks for students bags etc., book display racks, bulletin boards and stationery items like index cards, borrowers cards, labels and registers.

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.

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

Offices Requirements

Coordinator Room:

There should be a separate office for the Coordinator with attached toilet and provision for visitor's room. Independent telephone facility with internet connection is a must for the Coordinator office.

There should be adequate number of office rooms in proportion to the number of teaching faculty with telephone and internet connection

Record Room (Optional)

There should be a separate record room with steel racks, built-in shelves and racks, cupboards and filing cabinets for proper storage of records and other important papers/ documents belonging to the college.

Other Facilities

Safe drinking water and adequate sanitary/toilet facilities should be available for both men and women separately in the college. Toilet facility to the students should be there along with hand washing facility.

Fire Extinguisher

Adequate provision for extinguishing fire should be available as per the local byelaws.

Playground

Playground should be spacious for outdoor sports like Volleyball, football, badminton etc.

Recreation

There should be facilities for indoor and outdoor games for the students

LIST OF TOOLS AND EQUIPMENT REQUIRED FOR BPO TRAINING

A. LIST OF COMMON EQUIPMENTS

S.n.	Name of equipment	Minimum qty. required
1.	Hot air oven, heating chamber size-36" wx24"dx30"h, with double layer toughened front visible glass with inside light arrangement, max temp. 350degree c 12 kw rating and 1 hp3 phase motor for fan with digital timer thermostat temp controller.	1 no.
2.	Polisher converted to cone sanding, 2 hp 3 phase motor	1 no.
3.	Infra red oven (optional)	1no.
4.	Bench grinder cum sander, 0.5 hp single phase motor, abrasive wheel size 10" x 1"	1 no.
5.	Pillar drilling machine, drilling capacity 25mm, pillar dia 87mm max. Distance spindle to table 600mm, table working surface dia 400mm with 1hp 3 phase motor	1 no.
6.	Bench drilling machine with sand, capacity ½"	1 no.
7.	Industrial leather and canvas sewing machine with ¼" hp motor	1 no.
8.	Adjustable circular saw, circular saw dia 18", working table size 24"x36", max depth of cut 5 ½" with 3hp 3 phase motor	1 no.
9.	Belt and disc sander, disc dia. 10", belt size 6"x 48" with 1 hp 3 phase motor	1 no.
10.	All-purpose saw , temperature range 100-600 degrees c, power input 2000w	1 no.
11.	Hot air gun , temperature range 100-600 degree c, power input 2000w	1 no.
12.	Jig saw machine, sawing depth in wood 54mm, rated 350w	1 no.
13.	High vacuum machine with ¼" hp motor	1 no.
14.	Removable mandrills	3 no.
15.	Mandrill for air suction mounting and draping for sockets	3 no.
17.	Hot water bath for softening low temperature thermoplastic sheets	1 no.

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18	Draping frame size (small)	2 no.
19.	Draping frame size (large)	2 no.
20.	Adjustable / fixed grinding and milling machine with dust collector	1no.
21.	Sanding roll	02
22.	Sanding sleeve	02
23.	Sanding drum	02
24.	Tool holder	05
25.	Deep drawing tool set	02
26	Rasp head	01
27.	Hot sealing iron?	02
28.	Staple gun	02
29.	Hand drill machine	04
30.	Cord less hand drill machine	02
31.	Instrumented GAIT ANALYZER AND TRAINER (optional for BPO program)	01
32.	Shoe finishing machine	01
33.	WORKING TABLE WITH PEG BOARD (minimum 10 tables are required for 10 students)	10
34.	Over locking machine	01
35.	Laser aligner	01
36.	Lathe machine (optional)	01
37	Inter locking machine	01
TOTAL		

B. List of common Tools and Material

S.No.	Name of Equipment	Minimum Qty. Required
1.	Flat file bastard 2 nd cut 10", 2 nd cut 12"	10 no. each
	Aluminum Flat File 10" & 12"	10 no. each
2.	Round file 6", 8", 2 nd cut	10 no. each
3.	Flat file 10" round 2 nd cut	10 no each
4.	Triangular file 6", 10" 2 nd cut	10 no each
5.	Rasp file half round 10", 12", 8"	10 no. each
6.	Rasp file flat 10", 12"	10 no. each
7.	Rasp file round 6", 10"	10 no. each
8.	Screw driver 150x6mm, 200x8mm, 250x8mm	10 no. each
9.	Flat chisel 12mm, 20mm, 25mm	2no. each
10.	Cold chisel 12mm, 20mm	2no. each
11.	Half round chisel 12mm, 20mm	2 no. each
12.	Ruler steel 600mm, 300mm	2no. each
13.	Steel square with leg 200mm	2 no. each
14.	Caliper inside/outside 200mm	2no. each
15.	Compass/ Driver 200mm Outside/inside caliper	2 no. each
16.	Hammer ball peen 500 gms, 250gms	10 no. each
17.	Mallet hammer with handle	2no. each
18.	Hammer seaming plier (pincer) 10", 12"	4 no. each
19.	Nipper 150mm, 200mm	2 no. each
20.	plier 200mm	10 no. each

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21.	Long nose plier 150 mm	10 no. each
22.	Revolving Hole punch 250gms	10 no. each
23.	Centre punch	10 no. each
24.	hole punch 2mm, 3mm	3 no. each
25.	Hole punch set	2 no.
26.	Scissor 10" & 12 "	10 no.each
27.	Hacksaw Frame 300mm	10 no.
28.	Hacksaw blades 300mm	1 pkt of 144 pc
29.	Tap set 3, 4,5,6,7,.....mm	2 no. each
30.	Tap handle	2 no. each
31.	Grip plier	10 no.
32.	Die set 3,4,5,6,7,.....mm	2 no. each
33.	Cross pein hammer	10 no.
34.	wire cutter	10 no.
35.	Measuring tape	10 no.
36.	Shoe maker hammer	5 no.
37.	Anvil	2no.
38.	Half round leather Knife (Rapi)	5 no.
39.	Nipper shoe maker 8"	5 no.
40.	Leather knife	2 no.
41.	Bender brace 5.5 mm	1 no.
42.	Bender brace 6.5 mm	1no.
43.	cone sander fine, medium, coarse	10 no. each
44.	Plaster knife 150x200mm, 2000x750x350mm	10 no.
45.	Upper Limb Prosthetic Kit (B/E, A/E, S.D) body powered	2 no. each

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46.	Externally powered kit (B/E & A/E)	1 each
47.	Vice limb maker (modified)	1 no.
48.	Bending fork (Set of two pieces)	2 no.
49.	Caliper A-P measurement above knee	2 no.
50.	Ear Protector	05 no.
51.	Nut replacement tool 7mm, 9mm	2 no. each
52.	Heat proof gloves	4 pairs
53.	Cooper rivets ¼", ½" material	1 kg each
54.	Aluminium rivets ¼", ½" material	1 kg each
55.	Eyelet punch	10 no.
56.	Rivet head finishing punch	10 no.
57.	Plastic D-rings 1", 1 ½", & 2" material	5 pkts each
58.	Buckles 1", 1 ½' & 2" Material	5 pktseach
59.	Micrometer	2 no.
60.	Ritz scale for M-L diameter/ALIMCO B.K. caliper	2 no.
61.	Allen keys / T-handheld Allen keys (1mm-10mm)	10 set
62.	Press button	5 pkts
63.	Evathene foam 4mm, 6mm, 8mm thickness	5 sheets each
64.	Polypropylene and co polymer sheets (white) 3mm, 4mm & 5mm thickness	5 sheets each
65.	Dendrite solution	5 ltr (5 tin)
66.	Velcro straps (hook & loop) ¾", 1" and 2"	2 roll each
67.	Nappa leather	5000 d/m

68.	Low temperature thermo plastic sheets 3.2mm/4.2 mm thickness	5 sheets each
69.	Aluminum strips (4mm) thickness	5 kg.
70.	Aluminium sheet (4mm thicknes), 1 mm=18 gauge (BSW)	2 sheet
71.	Drill bits, Full Set Max diameter (7/64", 1/8", 9/64", 5/32", 3/16", 11/64", 1/4", 3/8", 1/2")	1 set
72.	Different modular system for lower limb prostheses	5 set each
73.	Torque wrench	01
74.	Bench Vice	10
75.	Vernier Caliper (adjustable digital)	10
76.	V-BOX	02

B. LIST OF TOOLS AND EQUIPMENT REQUIRED FOR PATIENT EXAMINATION AND CASTING ROOM

S.No.	Name of Equipment	Minimum Qty.Required
1.	MEASURING TAPE	10
2.	FLEXIBLE STEEL RULE	10
3.	ALUMINIUM TRIPOD	02
4.	CASTING APPARATUS UNDER WEIGHT BEARING	02
5.	CASTING APPARATUS FOR ABOVE KNEE AMPUTEE	01
6.	PLASTER BANDAGE TROLLEY	01
7.	FOOT MEASURING DEVICE	01
8.	OSCILLATING SAW – MULTIMASTER	02
9.	SPINAL CASTING APPARATUS	02

10.	HOOK KNIFE	05
11.	PLASTER CUTTING SCISSORS	04
12.	EXAMINATION COUCH	02
13.	X-RAY IMAGE VIEWER	02
14.	GONIOMETER	05
15.	Pedobarography machine	01

D: PLASTER MODIFICATION AREA / ROOM

S.No.	Name of Equipment	Minimum Qty Required
1.	PLASTER WORK TABLE	02
2.	PLASTER CAST SHELF	01
3.	PIPE VICE	05
4.	PLASTER BUCKET	05
5.	MIXING BOWL	20
6.	PLASTER STIRRER	20
7.	SURFORM FILE FLAT	20
8.	SURFORM FILE ROUND (Blade only)	15
9.	SURFORM FILE HALF ROUND (Blade only)	15
10.	PLASTER SPATULA	15
11.	TAPE MEASURE	10
12.	GONIOMETER	05
13.	SPECIAL PLASTER KNIFE	05
14.	DRAW KNIFE	02
15.	Plaster Cutting Scissors	04

16	MANDRILLS	20
17.	PLASTER SEPARATION SINK	01

E: PATIENT TRIAL AREA

S.No.	Name of Equipment	Minimum QtyRequired
1.	PARALLEL BAR WITH MIRROR ON BOTH SIDE	01
2.	PORTABLE HEAT GUN	01
3.	CHORDLESS HAND DRILL MACHINE	01
4.	REVOLVING CENTRE PUNCH	05

CLINICAL PRACTICUM-

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

- Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal prosthetic and orthotic solution using information from the patient assessment, other members of the health care team, medical charts, etc.
- Communicate and discuss patient goals and expectations and discuss and debate the prosthetic management with the patient, co-workers and other members of the health care team.
- Reliably measure and capture a positive cast or image of patient / clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
- Identify, prescribe and justify selection of appropriate materials and componentry in the fabrication of the prostheses or orthoses.
- Construct the prostheses or orthoses using appropriate fabrication techniques in preparation for the initial fitting.
- Fit the prostheses or orthoses to the patient using static and dynamic functional criteria established from the original assessment.
- Evaluate the quality of the prostheses or orthoses fit to ensure the appropriate interface contouring, force application and trim lines.
- Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
- Assess and solve prosthetic or orthotic problems as part of long term patient care.
- Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.

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- Communicate effectively with patient, co-workers, and other health care professionals in such a manner that will ensure the highest quality of service and reflect a professional attitude on the part of the student.
- Educate the patient /client and/or caregiver on use, care and function of the prostheses or orthoses.
- Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the patient at the centre.

MPO-1st Year

Course Code	Title	Theory Hrs	Practical Hrs	Total Hrs	Marks Theory	Marks Practical	Total Marks	Credit Points
MPO101	Advance Lower Extremity Orthotics & Clinical Gait Analysis	60	350	410	100	100	200	
MPO102	Advanced Lower Extremity Prosthetics & Clinical Gait Analysis	60	350	410	100	100	200	
MPO103	Research Methodology & Biostatistics	60	----	60	100	--	100	
MPO104	Mechatronics	60	-----	60	100	---	100	
MPO105	Applied Biomechanics & Kinesiology	60		60	100			
	Dissertation		220	220	-----	----	----	
	Total	300	920	220	500	200	700	

- Note:1. Minimum Two Seminar Presentation, Two Journal Club, and Five Case Study presentation per candidate is mandatory.
2. There will no examination for dissertation in first year. The candidate will make research proposal as per the guidance of supervisor and get it approved by Research Review and Ethical Committee.

MPO-2nd year

Course Code	Title	Theory Hrs	Practical Hrs	Total Hrs	Marks Theory	Marks Practical	Total Marks	Credit Points
MPO2 01	Advanced Upper Extremity Prosthetics	60	200	260	100	100	200	
MPO2 02	Advanced Upper Extremity Orthotics	60	160	220	100	100	200	
MPO2 03	Advance Spinal Orthotics	60	200	260	100	100	200	
MPO2 04	Pedagogy in P&O Education & Administration, Management & Ethical Issues	80	-----	80	100	---	100	
MPO2 05	Dissertation		400	400	-----	200	200	
	Total	260	980 1	220	400	500	900	

Note: Minimum Two Seminar Presentation, Two Journal Club, and Five Case Study presentation per Candidate is mandatory.

TITLE----- Advance Lower Extremity Orthotics & Clinical Gait Analysis
COURSE CODE--- MPO101
TEACHING HOURS---- 60 (Theory)
CREDITS --- As per affiliated university norms

Course Content

Anatomy & kinesiology of lower extremity, Ergonomic principles in lower extremity orthotics, International Organization for Standardization (ISO) terminology,

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.

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.

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.

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.

Orthotic Management of Knee -anatomy of knee joint, Biomechanics of knee motion, Classification, Biomechanical consideration, Knee orthosis & its application.

Knee orthosis for osteoarthritis: Efficacy of knee orthoses, Effect of insoles, Orthoses for patellofemoral dysfunction & Orthotic knee joints & its Classification.

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.

Orthotic management of Hip -anatomy of Hip joint, Biomechanics of Hip motion, Classification, Biomechanical consideration. Hip orthosis & its application, orthotic Hip joints & its Classification

Hip knee ankle orthosis: Classification, Biomechanical consideration, Indication of Hip knee ankle foot orthosis, Evaluation and prescription, Various Hip knee ankle foot orthosis design.

Orthotic management of the neuropathic and or dysvascular patient:

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.

Orthotic management for persons with neuromuscular disorders:

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

Orthotic management of Knee for sports related disorders:

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

Orthotic management in total hip and knee replacement:

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

Orthotic management for person with post-polio syndrome:

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 squal, Difference between post polio syndrome and post polio squal, Current issue and research finding, Treatment consideration, Assessment and examination, Various orthotic option, Effect of orthotic management, Biomechanical consideration during fitment of orthotic.

Orthotic management for person with spinal cord injury:

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.

Orthotic management for person with traumatic brain injury:

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

Pediatric Orthosis:

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

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

Orthotic management for multiple sclerosis patient: Pathophysiology, Current issues and research outcome, Assessment and evaluation tools, Treatment modalities, Effect of team approach, Orthotic consideration.

Orthotic management 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.

Orthotic management for myelomeningocele: Pathophysiology, Historical perspective, Assessment and evaluation tool, Level of involvement, Current issues and research outcome, Orthotic Consideration.

Clinical Gait Analysis

Abnormal gait, pathological Gait & Observational Gait Analysis, 3D Kinetic & kinematic Analysis, motion analysis & force plate analysis. Temporal & Spatial Gait Parameter, stride measurement system & energy Expenditure. Measurement of Energy Expenditure, pathological gait with emphasis on polio, cerebral palsy, dystrophies, hemiparesis, Paraparesis
Gait analysis of patients using FO, AFO, KO, KAFO, Hip Orthosis, & HKAFO

Reference:

- Basic biomechanics of musculoskeletal system: Nordin, Margaela; 2001
- Biomechanical basis of human movement: Hamill, Joseph, 2nd ed; 2003
- Biomechanics of musculoskeletal system: Nigg, Benno M.ed, 3rd ed
- Clinical Biomechanics: Dvir, Zeevi, 2000

- Human body: Vigue, Mastin; 2004
- Human Body Dynamics: Tozeren, Aydin;2000
- Introduction to biomechanics: Humphrey, Jay D.; 2003
- Primes of biomechanics: Lucas, George L.
- Understanding balance: Roberts, Tristan D.M.; 1995
- Brunnstoms clinical kinesiology: Smith, Lausa K., 5th ed.;1996
- Clinical kinesiology and anatomy: Lippest, Lynn S., 4th ed.
- Introduction to kinesiology: Hoffman Shirt J,2nd ed.; 2005
- Kinesiology: Oatis, Casol A; 2004
- Kinesiology: Muscolino, Joseph E; 2006
- Kinesiology: Soderberg, Gary L.,2nd ed.;1997
- Kinesiology flash cards: Lippest, Lynn.S,2nd ed;2006
- Principles of anatomy and physiology: Tortora, Gaseal J.,10th ed.; 2003
- Joint structure and function :Norkin S.,5th ed.
- Kinesiology: Brunnstrom s.,F. A. Davis, Philadelphia; 1996
- Biomechanical basis of orthotic and prosthetic management: Butterworth Heinmann
- Scientific basis of human movement : Gowitzke, Williams, Wilkins, Blatimore;1988
- Textbook of disorder and injuries of musculoskeletal system : Salter, R.B.
- Human neuroanatomy: Carpurter M.B.,Williams, Wilkins, Blatimore1983

TITLE----- Advanced Lower Extremity Prosthetics& Clinical Gait Analysis
COURSE CODE--- MPO102
TEACHING HOURS----- 60 (Theory)
CREDITS --- As per affiliated university norms

Contents

1. Prosthetic Foot:

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 :

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:

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. Prosthetic Management of Partial Foot Amputation:

Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management Partial foot amputation.

5. Prosthetic Management of Syme's Amputation :

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. Prosthetic Management Transtibial Amputation:

Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in Transtibial prosthetic management.

7. Prosthetic Management of Through knee Disarticulation :

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. Prosthetic Management of Transfemoral Amputation:
Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management Transfemoral amputation.
9. Prosthetic Management of Hip Disarticulation & TransPelvic Amputation:
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. Prosthetic management of translumbar amputation (hemisymphorectomy):
Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management of translumbar amputation
11. Prosthetic Management of congenital deficiency:
Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management of congenital deficiency
12. Prosthetic management of multiple limb deficient child
Medical Consideration, Advancement in socket technology, Biomechanics of Prosthetic gait, Gait analysis of Prosthetic gait Current trends in prosthetic management of multiple deficiency
13. Lower -Limb Prosthetic Adaptations for Sports and Recreation.
14. Emerging trends in lower limb prosthetics: research and development.
15. Fitting and training the bilateral lower limb amputee.
16. Osseo integration technique and its application
17. CAD-CAM Sockets

Reference:

- A text book of computer science for prosthetics & orthotic : S.K Panda , A.N Nanda ,R.R Swain, 1st edition; 2010.
- Amputation surgical practice & patient : Murdoch , G edition ;1996.
- Amputation & prosthetics : macy ,bella ,2nd edition ; 2002.
- Atlas of amputation & limb deficiencies: smith ,Douglash ;2004.
- Biomechanics of foot & ankle : Donatelli ,Robert A, 2nd edition;1996.
- Clinical skill in treating the foot : Tollafeld, Merriman, edition;1997.
- Essentials of prosthetics & orthotics : Agarwal , AK ;2013.
- Foot & ankle disorders: Lippert ,F.G ;2003.
- Foot & ankle in sports : Baxler D.E ; 1995.
- Foot orthosis : WU,Kent , k.ed ; 1990.
- Lower limb amputation : Cristian ,Adrian ; 2006.

- Orthotics & Prosthetics in rehabilitation : Iusaudi ,Michelle M , 2nd edition ; 2007.
- Prosthetics & Orthotics : Seymour , Ron ; 2002.
- Prosthetics & Orthotics : Shurr ,G. Donald , 2nd edition ; 2000.
- Prosthetics & Orthotics patient management ,Carroll ,Kevin ; 2006.
- Therapy for amputee : Engstorm ,Barbare , 3rd edition , 1999.
- Ergonomics for therapist , Jacobs ,Karens ,ed ,3rd edition; 2008.
- Comprehensive management of upper limb amputee,Atkins ,D.J ; 1989.
- Hand book of diabetes management ,Zazworsky ,Donna ,ed ; 2006.

TITLE----- Research Methodology & Biostatistics
COURSE CODE--- MPO103
TEACHING HOURS----- 60 (Theory)
CREDITS --- As per affiliated university norms

Section A

Research Methodology

Unit-1

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. 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.

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.

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

Section -B

Biostatistics

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.

Theory of probability – principles and properties of normal distribution – binomial distribution – interpretation of data using the normal probability curve – causes of distribution – deviations from the normal forms.

Correlation – meaning – coefficient of correlation – linear correlation – product moment correlation – rank correlation, biserial correlation, tetracoric correlation partial and multiple correlations – regression equation.

Variance – concept – foundations – assumptions – one way classification. ANOVA MANOVA, ANCOVA, MANCOVA.

Item analysis – item pool – its selection – item difficulty item variance – item conduction – time validity – difficulty index.

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.

Selection appropriate statistics methods in the research, receivers operating characteristics

Reference:

- Computer analysis and qualitative research : Nigel G. Fielding & Raymond M. Lee, 1st edition,1998
- Essential Research Methods : Rubbin, Allen, 2nd edition 2010
- Research design explained : Mitchell, Mark L , 7th edition, 2010
- Research Methodology : Kothari, C.R, 2nd edition,2011
- Research Methodology : Kumar,5th edition, 2006
- Research Methodology and Biostatistics : Bais,Vinod Kumar, 2nd edition, 2013
- Research Method a modular approach: Jackson,sherri L ,2nd edition,2011
- Foundation of clinical research and application to practice (portney)
- Non parametric statistics for the behaviour sciences : Mc graw hill sieger, Sydney
- Research: the validation of clinical practice: FAdavis
- Clinical Research Survival Guide : Niebauer, Josef ed, 2002
- Biostatistics c Daniel: ww,5th edition 1987
- Biostatistics: The bare essentials : Norman, Geoffrey R, 2nd edition,2000
- Introduction to biostatistics: Glover ,Thomas,2002
- Manual of biostatistics :Baride,JP ,2003
- Methods in biostatistics : Mahajan , B.K, 6th edition, 2004
- Simple biostatistics: Indrayan. A, 2nd edition

TITLE----- Biomechatronics
COURSE CODE--- MPO104
TEACHING HOURS----- 60 (Theory)
CREDITS --- As per affiliated university norms

1. CAD-CAM

Introduction to CAD, CAD application in Prosthetics and Orthotics, Graphical representation, Graphical representation of solid model, Geometric modeling, Solid modeling concept, Process of solid modeling, Geometric transformation, Vector and matrix algebra, Geometric transformation, Two dimensional transformation, Three dimensional transformation, Two and three dimensional transformation and projection, Projection, Prospective projection, Plane curve and cones, Cubes, Bezier curve, Solid modeling, Solid modeling concept, Half spaces, Boundary representation (B-rep), Constructive solid geometry (CSG), Other solid modeling schemes, Visibility concepts- Clipping, Visibility concepts- 3D Clipping, Visible lines and surface, MATLAB Tutorial

1.1. CAM

Introduction of CAM, Classification of CNC and NC system, Types of CNC machines , Purpose of CNC and NC system, Process of CNC, Advantage of CAM system, Application of CAD- CAM in P&O field, Advantage of CAD- CAM in P&O field, 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

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

B. 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

C. 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:

- Carbon materials for advanced technologies: Burchell, T.D; 1999
- Composites engineering handbook: Mallick, P.Ked; 1997
- Corrosion resistance of elastomers: Schlossberg, D; 1990
- Design with reinforced plastics: Mayer, Rayner M; 1993
- Engineering materials: Budinski, K.G; 1999; 6th edition
- Engineering materials technology: Jacobs, James A; 1997; 3rd edition
- Engineering mechanics dynamics: Soutas-Little, R.W; 1999
- Engineering with fiber-polymer engineering: Powell, Peter C; 1994
- Fundamentals of material science and engineering : Callister, William D; 2001
- History of engineering and technology: Garrison. Ervan; 1999; 2nd edition
- Introduction to polymers: Young, R.J; 1991; 2nd edition
- Management in engineering : Freeman-Bell, Gail; 1996; 2nd edition
- Material Science and engineering: Callister, William D; 2006; 6th edition
- Physics of plastics: Birley, A.W; 1992
- Plastics technology handbook: Chanda, Manas; 1993; 2nd edition
- Selecting thermoplastics for engineering applications: Macdermott, C.P; 1997; 2nd edition
- Text book of fluid mechanics: c Rajput, R.K; 2006; 3rd edition
- Text book of polymers: Bhatnagar, M.S; 2004; 1st, 2nd, 3rd edition
- Information technology for management: Turban E; 2002; 3rd edition
- Fundamentals of computers and I.T : A Jaiswal; 2006
- CAD-CAM principles, practice and manufacturing management : Chris MC Malvan; 1998
- Polymer Engineering Principles: Throne, James L, Pregarhoj, Richard C
- Plastic Engineering handbook of one society of the plastic industry: Berins Michael L; 5th edition
- International Plastics Handbook: Sacchtling, H

- Injection Moulding: Theory and Practice: Rubin, Irrin I
- Introduction to Mechantronics and measurement system: David G Alciatore, Micheal B Histard
- Introduction to Robotics:Mechanics and Control,3/E: John J. Craig; Prentice Hall
- Principles of Robot Motion, by Choset et all
- 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.Gonzalz.R.c and Lee C.S.G, Mc Graw- Hill Book Co, 1987
- Robotics for engineers, Yoram Koren, Mc Graw- Hill Book Co.,1992
- Robotics and Image Processing, Janakirama P.A, Tata Mc Graw- Hill, 1995

TITLE----- Applied Biomechanics & Kinesiology
COURSE CODE--- MPO105
TEACHING HOURS----- 60 (Theory)
CREDITS --- As per affiliated university norms

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

Mechanics & pathomechanics of muscle activity at the ankle & foot & analysis of the forces on the ankle & foot during activity.

b. Biomechanics of knee

Mechanics & pathomechanics of muscle activity at the knee & analysis of the forces on the knee during activity.

Unit-3

a. Biomechanics of Hip

Mechanics & pathomechanics of muscle activity at the hip & analysis of the forces on the Hip during activity.

b. Biomechanics of 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.

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:

Mechanics & pathomechanics of the muscle activity in the Shoulder complex & analysis of the forces on the Shoulder complex during activity.

b. Biomechanics of 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

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.

c. **Posture:** Mechanics & pathomechanics related to posture.

Reference:

- Basic biomechanics of musculoskeletal system: Nordin, Margaela; 2001
- Biomechanical basis of human movement: Hamill, Joseph, 2nd ed; 2003
- Biomechanics of musculoskeletal system: Nigg, Benno M.ed, 3rd ed
- Clinical Biomechanics: Dvir, Zeevi, 2000
- Human body: Vigue, Mastin; 2004
- Human Body Dynamics: Tozeren, Aydin; 2000
- Introduction to biomechanics: Humphrey, Jay D.; 2003
- Primes of biomechanics: Lucas, George L.
- Understanding balance: Roberts, Tristan D.M.; 1995
- Brunnstoms clinical kinesiology: Smith, Lausa K., 5th ed.; 1996
- Clinical kinesiology and anatomy: Lippest, Lynn S., 4th ed.
- Introduction to kinesiology: Hoffman Shirt J, 2nd ed.; 2005
- Kinesiology: Oatis, Casol A; 2004
- Kinesiology: Muscolino, Joseph E; 2006
- Kinesiology: Soderberg, Gary L., 2nd ed.; 1997
- Kinesiology flash cards: Lippest, Lynn.S, 2nd ed; 2006
- Principles of anatomy and physiology: Tortora, Gaseal J., 10th ed.; 2003
- Joint structure and function :Norkin S., 5th ed.
- Kinesiology: Brunnstrom s., F. A. Davis, Philadelphia; 1996
- Biomechanical basis of orthotic and prosthetic management: Butterworth Heinmann
- Scientific basis of human movement : Gowitzke, Williams, Wilkins, Blatimore; 1988
- Textbook of disorder and injuries of musculoskeletal system : Salter, R.B.
- Human neuroanatomy: Carpurter M.B., Williams, Wilkins, Blatimore 1983

TITLE----- Clinical Practice in Lower Extremity Orthotics
COURSE CODE--- MPO151
TEACHING HOURS---- 380 (Practical)
CREDITS --- As per affiliated university norms

Objectives

1. The candidate should be able to assess, diagnose, plan and execute the orthotic treatment for children and adults with various neuromusculoskeletal disorder.
2. . To maintain clinical record.
3. Assessment of minimum 20 patients with various disorders.
4. Use of instrumentation in minimum 10 patients with disorders.
5. Plan and execute in minimum 5 patients with disorders.
6. Maintain clinical records.

TITLE----- Clinical Practice in Lower Extremity Prosthetics
COURSE CODE--- MPO152
TEACHING HOURS---- 380 (Practical)
CREDITS --- As per affiliated university norms

Objectives

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

TITLE----- Advanced Upper Extremity Prosthetics
COURSE CODE--- MPO 201
TEACHING HOURS----- 60
CREDITS --- As per affiliated university norms

1. General consideration:

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

2. Advancement in the upper extremity prosthetic components:-

- Myoelectric prosthetics
- Neuroelectric Prosthetics
- Myoacoustic Prosthetics
- And other latest developments

3. Prosthetic Management of Partial Hand Amputation;

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

4. Prosthetic Management of Wrist disarticulation;

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

5. Prosthetic Management of Transradial Amputation:

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

6. Prosthetic Management of Elbow Disarticulation:

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

7. Prosthetic Management of Transhumeral amputation:

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

8. Prosthetic Management of Shoulder Disarticulation:

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:

- omprehensive management of upper limb amputee[Atkirs ,D.J] 1989.
- Functional restoration of adults & children with upper extremity amputation :Meies, Robert H. ed, 2004,demas, NY.
- Upper extremity : Traumatic injuries & conditions – Child,S .(1997).
- A text book of computer science for prosthetics & orthotic : S.K Panda , A.N Nanda ,R.R Swain, 1st edition; 2010.
- Amputation surgical practice & patient : Murdoch , G edition ;1996.
- Amputation & prosthetics : macy ,bella ,2nd edition ; 2002.
- Atlas of amputation & limb deficiencies: smith ,Douglash ;2004.
- Essentials of prosthetics & orthotics : Agarwal , AK ;2013.
- Orthotics & Prosthetics in rehabilitation : lusaudi ,Michelle M , 2nd edition ; 2007.
- Prosthetics & Orthotics : Seymour , Ron ; 2002.
- Prosthetics & Orthotics : Shurr ,G. Donald , 2nd edition ; 2000.
- Prosthetics & Orthotics patient management ,Carroll ,Kevin ; 2006.
- Ergonomics for therapist , Jacobs ,Karens ,ed ,3rd edition; 2008.
- Common problems in pain management ,Ferrer –Brechtner ,T; 1990.
- Comprehensive management of upper limb amputee,Atkins ,D.J ; 1989.
- Hand book of diabetes management ,Zazworsky ,Donna ,ed ; 2006.

TITLE----- Advanced Upper Extremity Orthotics
COURSE CODE--- MPO 202
TEACHING HOURS---- 60
CREDITS --- As per affiliated university norms

Objectives

1. Gene ral Consideration

Functional Anatomy of Hand.
Bio-mechanical consideration in upper extremity orthotics.
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. Orthotic management of stroke and brain injured patient:

General principle, Pathophysiology, Various treatment option, Orthotic treatment, Ergonomic consideration

8. Orthotic management of spinal cord injury:

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

9. Orthotic management of burned hand:

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. Orthotic management of the arthritic hand and wrist:

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. Orthotic management of brachial plexus injuries:

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

12. Orthotic management of upper limb fracture:

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. Orthotic management of overuse disorders of the upper limb:

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:

- Comprehensive management of upper limb amputee [Atkins ,D.J] 1989.
- Functional restoration of adults & children with upper extremity amputation :Meies, Robert H. ed, 2004,demas,NY.
- Upper extremity : Traumatic injuries & conditions – Child,S .(1997)
- Orthotics & Prosthetics in rehabilitation : lusaudi ,Michelle M , 2nd edition ; 2007.
- Orthotics in functional rehabilitation of the lower limb : Nowoczenski ,Deborah A ; 1997.
- Prosthetics & Orthotics : Seymour , Ron ; 2002.
- Prosthetics & Orthotics : Shurr ,G. Donald , 2nd edition ; 2000.
- Prosthetics & Orthotics patient management ,Carroll ,Kevin ; 2006.
- Therapy for amputee : Engstorm ,Barbare , 3rd edition , 1999.
- Orthotics in rehabilitation ,Mckee ,pat ; 1998.
- Ergonomics for therapist , Jacobs ,Karens ,ed ,3rd edition; 2008.
- AO manual of fracture management ,Wagner ,Michael ; 2006.
- AO Principles of fracture management ,Ruedi,Thomas P ; 2000.
- Common problems in pain management ,Ferrer –Brechtner ,T; 1990.
- Comprehensive management of upper limb amputee,Atkins ,D.J ; 1989.
- Hand book of diabetes management ,Zazworsky ,Donna ,ed ; 2006.
- Functional fracture bracing [A saniento L.L Latta] ; 2003.
- Orthotics in neurological rehabilitation –Aiseu, Dereos Publication ,New York 1992.
- Orthotics : clinical practice & rehabilitation technology – cluscluillLivingston ,Redford ,J.B. ; 1993.
- Atlas of limb prosthetics –Bowker ,P & Michace ,D. chaps ,C.V Mosby.
- Prosthetics and Orthotics: Shurr & Micheal
- Orthotics A Comprehensive Clinical Approach- Edelstein & Brucker

TITLE----- Advanced Spinal Orthotics
COURSE CODE--- MPO 203
TEACHING HOURS---- 60
CREDITS --- As per affiliated university norms

1. Biomechanics of spine

Physical characteristics of the spine
The transmitting problem
Other limiting factor
Normal kinematics
Application of force and its resolution
Creep and biomechanical adaptation

2. Spinal orthosis & its Classification

Soft spinal orthosis
Semi rigid spinal orthosis
Rigid spinal orthosis.

3. Principles & Components of spinal Orthosis.

4. Technological guidelines for spinal Orthosis

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

5. Orthosis for Spinal pain: Pathophysiology, Treatment recommendations

Cervical pain: Mechanism of action of lumbar orthosis, Motion restriction, Unloading of spinal column, Side effect and other consideration, Outcome studies and effectiveness of lumbar orthosis

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

6. Orthotic management of Scoliosis :

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 :

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, Lumbar 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 occipito mandibular immobilizers, Yale cervicothoracic orthosis, Minerva cervicothoracic orthosis, Halo orthosis, WISS orthosis, Other cervicothoracic orthosis. Effects of body alignment, balance and compensation.

Reference:

- Rehabilitaion of spine : Liebenon, Craid ed, 2nd edition
- Clinical biomechanics of the spine : White, Augustan, Lippincott, Williams, 2nd edition
- Essentials of prosthetics & orthotics : Agarwal , AK ;2013.
- Orthotics : Edelstein ,joan E ; 2002.

- Orthotics & Prosthetics in rehabilitation : Iusaudi ,Michelle M , 2nd edition ; 2007.
- Orthotics in functional rehabilitation of the lower limb : Nowoczenski ,Deborah A ; 1997.
- Prosthetics & Orthotics : Seymour , Ron ; 2002.
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- Prosthetics & Orthotics patient management ,Carroll ,Kevin ; 2006.
- Orthotics in rehabilitation ,Mckee ,pat ; 1998 .[JP Morgan].
- Ergonomics for therapist , Jacobs ,Karens ,ed ,3rd edition; 2008.
- AO manual of fracture management ,Wagner ,Michael ; 2006.
- AO Principales of fracture management ,Ruedi,Thomas P ; 2000.
- Common problems in pain management ,Ferrer –Brechtner ,T; 1990.
- AAOS Atlas of orthosis & assistive devices [John D. HSU].
- Orthotics in neurological rehabilitation –Aiseu, Dereos Publication ,New York 1992.
- Orthotics : clinical practice & rehabilitation technology – cluscluill Livingston ,Redford ,J.B. ; 1993.

TITLE----- Pedagogy in P&O Education & Administration, Legal, Ethical Issues
COURSE CODE--- MPO 204
TEACHING HOURS----- 60
CREDITS --- As per affiliated university norms

Part -I : 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 behaviour ,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 behavioural terms ,Unit planning ,Lesson planning
6. **Teaching aids :**Types of teaching aids ,Principles of selection, preparation and use of audio-visual aids
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.

Part -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:

- Badheka Gijubhai (2006) Diwaswapna. Montessori Bal Shikshan Samiti: Churu, Rajaldesar.
- Brown George and E.C. Wragg (1993) Questioning, Routledge: UK
- Brown George and E.C.Wragg (1993), Explaining, Routledge : UK.
- Elisabeth Dunne and Bennet Neville (1990) Talking and Learning in Groups. Routledge .
- Holt, John (1990) Learning All the Time. Addison-Wesley Publishing Co: New York
- Michael Marland (Indian Edition, 2005) Craft of the Classroom: A Survival Guide, Heinemann Educational,
- Johnson, D.W. and R.T. Johanson (1999) Learning Together and Alone: Cooperative Competitive and individualistic learning. (5th edition).
- Allyn & Bacom: Boston Pollard, Andrew (2002) Reflective Teaching. Continuum: London
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- Mukunda Usha (2008) Inculcating and enhancing the reading habit. Excerpt from a training manual for librarians in the southern region as part of an NCERT workshop in January 2008.
- Educational objectives: Stones E ,2012
- Educational psychology: Tuckman, Bruce W, 2011
- Educational psychology: C.L.Kundu, 6th edition,2015
- Educational psychology: Woolfolk, Anita,9th edition, 2011
- New dimensions of educational technology: Pathal,R.P, 2003

TITLE----- Clinical Practice in Upper Extremity Prosthetics
COURSE CODE--- MPO251
TEACHING HOURS---- 200 (Practical)
CREDITS --- As per affiliated university norms

Objectives

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

TITLE----- CLinical Practice in Upper Extremity Orthotics
COURSE CODE--- MPO 252
TEACHING HOURS----- 160 (Practical)
CREDITS --- As per affiliated university norms

Objectives

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

TITLE----- Clinical Practice in Spinal Orthotics
COURSE CODE--- MPO 253
TEACHING HOURS---- 200 (Practical)
CREDITS --- As per affiliated university norms

Objectives

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

TITLE----- DISSERTATION
COURSE CODE--- MPO 254
TEACHING HOURS---- 640 (220 in 1ST year & 420 in 2nd year) (Practical)
CREDITS --- As per affiliated university norms

Student will select a topic in his/her area of interest, in consultation with a supervisor/Guide, qualified for the purpose as recommended by the council/University for and carry out an independent dissertation, which will involve making research proposal, conduct of the work as per the documented methodology, statistical analysis, dissertation writing. The work will build on the knowledge acquired through study of research methodology and Biostatistics. Each candidate shall submit three copies of a dissertation well in advance before the commencement of 2nd Year Examination.

Evaluation of the dissertation will be done by the examiner (s) appointed by the University.

The approved guide for the dissertation will be allocated to the candidate immediately after the admission in the MPO Programme.