

# **SYLLABUS**

**MASTERS IN PROSTHETICS & ORTHOTICS (MPO)**  
**Norms, Regulations & Course Content**

**REHABILITATION COUNCIL OF INDIA**

**(Statutory Body under the Ministry of Social Justice and Empowerment)**

**B-22, Qutab Institutional Area , New Delhi – 110 016**

*e-mail [rehabstd@nde.vsnl.net.in](mailto:rehabstd@nde.vsnl.net.in)*

*website : <http://rehabcouncil.nic.in>*

**2003**

## **Nomenclature of the course: Masters in Prosthetics & Orthotics (MPO)**

### **Introduction:**

Master level programme in Prosthetics & Orthotics education of RCI will be the first of its kind in India. The programme is designed to prepare individuals to be leaders in field of P & O technology as the frame work for problem solving. The two year full time applied science curriculum combines clinically oriented course work in Rehabilitation Medicine, allied health science and P & O with Engineering. M.Sc. P & O education programme represents one of two master degree program tailored to meet the needs of business, technology & health care. The programme is administered through the collaboration with the RCI.

### **Aims and Objectives:**

1. To provide better prosthetic and Orthotic care in the treatment of physically challenged in the rehabilitation setting.
2. To provide the students with clinical problems solving skills for life long learning combined with advanced biomechanical education.
3. To provide expert knowledge in Master in prosthetic Orthotic education.
4. To help the society & institutes and national requirements in the field of prosthetics & Orthotic with a growing technological advancement and human resource development.
5. To promote research and development in the field of P & O & rehabilitation science to enhance quality of life

### **Entry Requirement:**

Bachelors degree in Prosthetics & Orthotics from recognized University & RCI.

### **Faculty requirement:**

1) Professor (P&O) and Head of the Department	1
2) Associate Professor (Prosthetics)	1
3) Associate Professor (Orthotics)	1
4) Lecturers (Prosthetics)	2
5) Lecturers (Orthotics)	2

**Total ----- 7**

### **Qualification & Experience of the Faculty**

#### **Professor & Head of the Department of Prosthetics & Orthotics**

Essential: Post Graduate Degree in Prosthetics & Orthotics from an institution/ university recognised by RCI, with a minimum of 12 years of teaching experience in any recognised Prosthetic & Orthotic Institution

Desirable: PhD in Prosthetics and Orthotics

or

In the absence of the above, B.Sc. (in Prosthetics and Orthotics) with 15 years Teaching Experience.

### **Lecturer in Prosthetics & Orthotics**

Degree in Prosthetics & Orthotics from a recognised University with a minimum of 3 years experience in teaching in a recognised institution.

or

Diploma in Prosthetics & Orthotics with a minimum of 5 years experience in teaching in a recognised Institution.

### **Mode of Admission:**

As per norms of affiliated college /university

**Teacher student ratio:** Two nos. per teacher  
**Minimum attendance required is 75%.**

### **Requirement for laboratory facilities:**

- 1) CAD-CAM Laboratory
- 2) Computer Laboratory with internet facility
- 3) Biomechanics Laboratory – All types of scan equipment for pressure analysis baseline (for prosthetics alignment), vertical jigs, I.E. gait laboratory
- 4) Prosthetics Laboratory (Ultra Modern)
  - Vacuum forming and lamination machine with all accessories.
  - Over with all necessary arrangements.
  - Different types of hot air guns. Electric cast cutters.
  - Central dust collection systems with outlet to each dust producing machine.
  - Mobile and stationary air compressor with all accessories. Pneumatic chisel.
  - Socket routes (minimum three) with different types of heads connected to central dust collection machine.
  - Sockets duplicating machine.
  - Electronics grinding and milling with all accessories.
  - Different types of polishing tool for Routers.
  - Vertical Belt Sander.
  - University Band Saw.
  - Basic engineering M/C like milling drilling etc.
  - Plastic tools, other Prosthetics tools etc.
  - Hydraulic, Pneumatic, Micro-processor controlled knees ten each type.
- 5) U. E. Prosthetics
  - Electronics Laboratory
  - Mayo-electric hands A/E & B/E atleast five units each type with necessary tooling.
- 6) Orthotics
  - Lower extremity.
  - Flat over (table model) with mobile compressor.
  - Basic Engineering machines.

- 7) Polymers Laboratory for Development of
  - Silicones prosthetics, PU fillers, Cross linked foams.
- 8) Mechanical testing Laboratory
  - For testing of various materials.
  - Like metals, plastics etc.
  - With different tests.
- 9) Advanced spinal Orthotics Laboratory

**Evaluation System:**

Two examinations - 1 per year

A candidate can take a maximum of one supplementary per academic year.

For passing the exams, a candidate shall secure minimum 50% marks each in theory & practical. After successful completion of first year-part 1 and second year-part 2, Post Graduate degree will be awarded by the university.

**First year:**

**Clinical Gait analysis- 100 hrs**

To learn the significance of differences in the magnitude of internal joint reaction forces and force moments. To collect and interpret normal and pathological 3-D kinematic and kinetic gait data. Application of the same to make clinical decision for optimal Orthotic and Prosthetics patient care.

**CAD/CAM in P & O and electronics- 20 hrs**

Theoretical and practical analysis of the application of CAD/CAM. Use of computers in designing new Orthotic and Prosthetic devices with knowledge of biomechanical principles.

**Practical- 100 hrs**

**Clinical Gait Analysis Practical**

- |                                |   |
|--------------------------------|---|
| 1) Transtibial Amputee (TT)    | 3 |
| 2) Transfemoral (TF)           | 2 |
| 3) Through Hip (TH)            | 1 |
| 4) Moulded AFQs                | 2 |
| 5) Articulated AFQs            | 2 |
| 6) KAFO's (Functional Type)    | 1 |
| 7) KAFO's (with lock)          | 1 |
| 8) HKAFO                       | 1 |
| 9) Bilateral Involvement       | 1 |
| 10) Pathological Gait Analysis | 2 |

**Total-----16**

**CAD/CAM in P & O**

Fabrication & Designing of various gadgets with the help of CAD/CAM

1) Transtibial Amputations	5 Practicals
2) Transfemoral Amputations	3
3) Through Knee	1
4) Through Hip	1
5) Moulded AFO's	3
6) Quadrilateral sockets for KAFO	2
7) Under arm Braces	2
8) DLSO- AP	2
9) Moulded Cervical Orthosis	1
<b>Total -----</b>	<b>20</b>

**Biomechanics**

Demonstrations	10 hrs
Biomechanical	5 hrs

**Biomechanics & Kinesiology- 15 hrs**

Introduction of biomechanical principles that act to restore normal or near normal patient functions. With the help of well equipped gait lab to formulate the biomechanical effectiveness of a specific Orthotics or prosthetic device.

**Advanced materials in P& O- 15 hrs**

**Advanced Lower Extremity Orthotics- 10 hrs**

Clinical and technical training for the practice of Orthotics and emphasizing adult and pediatrics Lower Extremity Orthotics.

**Advanced Lower Extremity Prosthetics- 10 hrs**

Clinical and technical training for the practice of Prosthetics and emphasizing adult and pediatrics Lower Extremity Prostheses.

**Clinical practice in Lower Extremity Orthotics- 400 hrs**

Fabrication of lower extremity Orthotics Systems and testing their efficacy on the subjects. Minimum 10 experiments.

**Clinical practice in Lower Extremity Prosthetics- 400 hrs**

Fabrication of lower extremity Prosthetic Systems testing their efficacy on the subjects. Minimum 10 experiments.

**Seminar in P & O 10 hrs**

**Information Technology & Management Skills- 60 hrs**

Lectures (60 hrs.) from guest faculty on any one elective subject from the following-

- 1) Biomechanics related to Prosthetics/Orthotics-
- 2) P and O in CBR
- 3) Hydraulics and pneumatics
- 4) Robotics
- 5) Ergonomic designs of Prosthesis and Orthosis

**Examination:**

**MPO- part 1**

	<b>Theory</b>	<b>Practical</b>	
<b>Total</b>			
Biomechanics & Kinesology	100	-	100
Advanced materials in P& O	100	-	100
Advanced lower extremity orthotics-	100	100	200
Advanced lower extremity prosthetics-	100	100	200
Information technology & management	100	-	100
		<b>Total</b>	<b>700</b>

**Second Year**

<b>Mobility Aids in Rehabilitation</b>	<b>15 hrs</b>
<b>Advanced upper extremity Orthotics</b>	<b>15 hrs</b>
<b>Advanced upper extremity prosthetics</b>	<b>15 hrs</b>
<b>Advanced spinal Orthotics</b>	<b>15 hrs</b>
<b>Clinical practices in upper extremity prosthetics</b>	<b>200hrs</b>
<b>Clinical practices in upper extremity Orthotics</b>	<b>200hrs</b>

- 1) Fabrication of atleast one B/E and A/E myoelectric hand and atleast one externally powered band.
- 2) Atleast one shoulder disarticulation/ Forequarter amputee should be fitted and presented in clinic.

**Clinical practices in spinal Orthotics** **200hrs**

- 1) Fabrication and fitting of atleast 2 different halo-pelvic systems
    - a) with moulded DLSO.
    - b) with milwankee brace.
  - 2) Atleast 3 various types of underarms Orthosis.
  - 3) Atleast 3 various types of advanced cervical/cervico-thoracic/cervico-thoracic lumbar sacral Orthosis etc.
- Fabrication and fitting atleast 3 different advanced upper extremity Orthosis systems:
- a) Externally powered Functional Arms Orthosis.
  - b) Various arm attachments with low temperature thermoplastics.

**Research methodology & data analysis** **20 hrs**

- Identification of objectives and research planning.
- Management of personal motivation establishing priorities and achieving objectives.
- Time management.

- Stimulation of creativity.
- Search and critical appraisal of literature.
- Role of supervisor.
- How to write a paper and get it published.
- Thesis writing.
- Presenting papers at scientific meetings.

**Project work**

**500hrs**

The candidate is advised to collect a topic for dissertation in specialty of his choice in P & O, perform related studies as regards materials, fabrications, designs, analysis of performance and prepare a complete project to be submitted to the University.

**Any one elective subject**

**20 hrs**

- **Molding design & concepts**
- **Mass production technology**
- **Cosmetic prosthesis**

**Field visits**

Field visits to be arranged by the Institute/affiliated university in specialized area related to P & O applications.

**Examination**

<b>Total</b>	<b>Theory</b>	<b>Practical</b>	
Rehabilitation aids	100	-	100
Advanced upper extremity orthotics	100	100	200
Advanced upper extremity prosthetics	100	100	200
Advanced spinal orthotics	100	100	200
Research methodology & data analysis	100	-	100
Project work	-	200	200
		<b>Total</b>	
<b>1000</b>			

**Reading Material:**

The library should have the following:

1. P & O books - 300
2. Engineering/allied books – 100
3. Journals – minimum 20 regular journals out of which 10 published in P & O.

**Recommended Books:**

1. Prosthetics atlas and Orthotics atlas – C.V. Mosby.
2. Orthotics in Neurological Rehabilitation – Aisen, Demos publication, New York 1992.
3. Kinesiology- Brunnstrom Singe, F.A. Davis-Philadelphia 1966.
4. Biomechanical Basis of Orthotics and Prosthetic management- Butterworth Heinemann.

5. Scientific Basis of Human Movement – Gowitzke, Williams and Wilkins, Blatimore, 1988.
6. Three- Dimensional Analysis of Human Movement, Human Kinetics-Allard, P., Stokes, I., Blanchi.
7. Nonparametric Statistics for the Behavioral Sciences- McGraw Hill Siegel, Sidney.
8. Research: The Validation of Clinical Practice – F.A. Davis.
9. Orthotics: Clinical Practice and Rehabilitation Technology- Churchill Livingstone, Redford, J.B. (1993).
10. The Functional Foot Orthosis, New York, Churchill Livingstone-Philips, J.W. (1995).
11. Lower Limb Amputations: A Guide to rehabilitation-F.A. Davis.
12. Hand Splinting: Principles and Methods (2<sup>nd</sup> ed) – St. Louis, C.V.Mosby.
13. Upper Extremity: Traumatic Injuries and Conditions- Child, S. (1997).
14. The Hand-Examination and disgnosis- Churcill Livingstone.
15. Polymer Engineering Principles- Throne, James L., and Pregelhof, Richard C.
16. Plastic Engineering Handbook of the Society of the Plastics Industry, 5<sup>th</sup> edition, New York- Berins Michael L.
17. International Plastics Handbook- Saechtling, H.
18. Injection Molding: Theory and Practice- Rubin, Irvin I.
19. Atlas of Limb Prosthetics- Bowker, P., and Michael, D. Chaps, C.V. Mosby.
20. Neural Prostheses: Replacing Motor Function after Disease or Disability-Popovic D.
21. Textbook of disorder and Injuries of the Musculoskeletal System-Salter, R.B.
22. Public Power & Administration- Wilenski, Hale & Iremonger, 1986.
23. Physical Therapy Administration & Management- Hickik Robert J.
24. Human Neuroanatomy- Carpenter M.B. Williams & Wilkins Baltimore, 1983.
25. Orthopedic Physical Therapy- Donatteli, London Churchill Livingstone, 1994.
26. Gait Analysis- Perry J., Black Thorofare, New Jersey, 1992.
27. Bio-Feedback- A practitioner's guide- Kerb D., Guiford Press.
28. Hand Rehabilitation- Christine, Churchill, Livingstone, London 1995.

### **Recommended Journals**

1. Clinical Kinesiology.
2. Journal of Prosthetics and Orthotics.
3. Journal of Rehabilitation Research and Development.
4. Archives of Physical Medicine and Rehabilitation.
5. Journal of Pediatric Orthopedics.
6. American Journal of Physical Medicine and Rehabilitation.
7. Journal of Biomechanics (Worldwide biomechanics).
8. Journal Association of Children's Prosthetics and Orthotics Clinics.
9. Journal of Clinical Prosthetics and Orthotics.

The list of recommended books and journals are suggestions and must be taken as a helpful guide for reading. Students are encouraged to refer to other books and study material and not to limit themselves to the study material listed above.

\*\*\*\*\*