# HEALTH PROFESSIONS COUNCIL OF SOUTH AFRICA

## PROFESSIONAL BOARD FOR OCCUPATIONAL THERAPY MEDICAL, ORTHOTICS & PROSTHETICS AND ARTS THERAPY.

### REGULATIONS AND MINIMUM STANDARDS RELATING TO THE REGISTRATION OF MEDICAL ORTHOTICS & PROSTHETICS STUDENTS

## INTRODUCTION

Medical Orthotics & Prosthetics Technologist fulfills an important role for service delivery in the field of Medical Orthotics & Prosthetics. The Orthotics & Prosthetics Technologist role is focused on the clinical evaluation, fitting, adjustment, supervision and manufacturing of Orthotics & Prosthetics through service delivery to the public.

The service of the Orthotics & Prosthetics Technologist is not limited to private sector but also aimed at relieving workload and service delivery in the public health sector.

The inclusion of well trained Medical Orthotics & Prosthetics Technologists into industry is an increase in productivity and service delivery in promoting and maintaining health in general.

## 1. GENERAL REQUIREMENTS

1.1 Educational objective, while reflecting the aims of the profession, should be flexible enough to accommodate changes in this field and advances in technology and knowledge for Medical Orthotics & Prosthetics sciences. The course of study should make students receptive to change and encourage interest in continuing education after qualification through existing academic structures.

1.2 Instruction in the primary subjects should precede study of the clinical subjects but may continue after the first year of study. The professional group of subjects should continue throughout the course.

1.3 Syllabi should be designed with reference to the expanded definition of the Scope of Medical Orthotics & Prosthetics Technologists. (Please refer to the Professional Board for Medical Orthotics & Prosthetics for further information).

1.4 Each academic institution presenting the programme should arrange for the effective integration of the appropriate course subjects with one another.

1.5 Lecturers must at least be registered Medical Orthotics & Prosthetics Technologists or equivalent.

1.6 The minimum entrance requirements for enrolment to study the Medical Orthotics & Prosthetics Technologist qualification will be determined by each academic institution

presenting the programme in line with policy for entrance to a qualification equal to NQF level 5. Recognition for Prior Learning (RPL) will also be used / considered in cases that fall outside the minimum entrance requirements as determined by each academic institution.

1.7. The student is required to complete a one year internship as prescribed in the guidelines before they can register as independent practitioners.

1.8 The duration of the diploma course in Medical Orthotics & Prosthetic is a minimum of three academic years (3600 Notional Study Hours) consisting of the following:

Primary Subjects – 705 Hours
Clinical Subjects – 243 Hours
Professional subjects – 2652 Hours

## 2. THE CURRICULUM

### 2.1 General

2.1.1 The course should be composed of the named primary, clinical and professional subjects. The educational authority may however arrange or name subjects according to their circumstances provided that the course meets the requirements stated in this regulation.

2.1.2 The relative importance of the primary, clinical and professional subjects is suggested by the following percentages:

Primary subjects: 20 percent;
Clinical subjects: 6 percent; and
Professional subjects: 74 percent.

This should be used as an approximate guide in course construction.

2.1.3 A semester is equivalent to half the academic year or not less than 24 weeks (including examination and supplementary examinations).

### 2.2 The Primary Subjects

The following subjects should all be examined:

#### 2.2.1 Anatomy and Physiology (3 Semesters – 138 Hours)

In the area of anatomy and physiology the student should have knowledge of the following:

- basic cell biology and histology
- the structure of the skeletal system, particularly the bones and joints of the lower and upper limbs, the shoulder girdle, the spine and the thorax
- the structure and function of the muscular system, with emphasis on the muscular systems of the lower and upper limbs, the shoulder girdle and the spine and thorax
- the structure and function of joints, including axes of rotation, range of movements and stabilization
- consideration of the body as a whole system, identification of physiological deviations and of their significance
- the nervous system, tissues, cardiovascular system, pulmonary system, immune system, endocrine system, and the secretor organs.

The student should have an understanding of the function of individual joints and muscles and the proficient in explaining their interaction. He/she should be knowledgeable in the area of pathological deviations and be able to analyse them by means of appropriate measuring instruments as well as by applying his/her knowledge of range of motion in order to be able to identify a viable prosthetic/orthotic treatment. The student should recognize that biomechanical as well as pathological factors must be viewed concurrently with anatomical factors.

2.2.2 Pathology (2 Semesters – 92 Hours)

The student will have an understanding of the following:

- inflammatory diseases
- degenerative diseases
- post-traumatic conditions
- tumours
- metabolic disorder
- abnormalities present at birth (congenital deformities)
- aseptic bone necrosis
- paralysis resulting from nerve lesions
- circulatory disorders
- amputations
- post-traumatic osteoporosis
- diseases of the spine
- spinal and thoracic deformities
- diseases of the pelvis and hip
- diseases of the knee
- diseases of the foot
- diseases of the shoulder, elbow and hand
- limb deformities
- skin disorders and wound repair.

The student should be able to comment on the aetiology and progression of the disease in question, as well as on its care and treatment. He/she must demonstrate proficiency in anatomy, physiology, biomechanics and pathology as well as the ability to coordinate these factors and arrive at the appropriate end result in his/her role as an orthopaedic technologist.

2.2.3 Mathematics & Technical Drawing (4 Semesters – 199 Hours)

The student will have knowledge of the following areas of mathematics and their applications to Biomechanics and Orthotics & Prosthetics Science.

- elementary mathematics: simple algebraic manipulation, indices, logarithms, solution of equations, trigonometric functions, standard trigonometric identities, solution of simple trigonometric equations
- functions: polynomial, rational, exponential, logarithmic
- differentiation: simple techniques, use in optimization and curve sketching
- integration: simple techniques, evaluation of areas, use of approximation procedures
- differential equations: first order equations, uses in biological modeling
- mastery and power usage of resources such as mathematical table, formulae and calculators.

The student will have knowledge of the following areas of technical drawing and their applications to Orthotics & Prosthetics Science.

- isometric sketching and three-dimensional visualization
- first and third angle projection
- auxiliary views and sections
- use of drawing standards
- application of machining tolerances
- simple assembly drawings
- applications in orthopaedic technology

2.2.4 Materials Technology (2 Semesters – 92 Hours)

The student will have an understanding of the characteristics, properties and the processing of the following commonly used materials with particular reference to their applications in orthotics & prosthetics:

- steel and its alloys
- non-ferrous metals and their alloys
- plastics: thermoforming, thermosetting, composites
- wood
- leather
- plaster of Paris
- adhesives

2.2.5 Clinic, Laboratory and Business Management (2 Semesters – 92 Hours)

The student will have knowledge of the theory and application of:

- materials acquisition, handling and stock control
- workforce management
- production cost calculations
- budgeting, invoicing, receipting and accounting
- clinic management, appointment systems, record keeping
- property management, care and maintenance
- environmental/ecological considerations

2.2.6 Mechanics (2 Semesters – 92 Hours)

The student will have an understanding of the applications of the following in that area of Biomechanics and Orthotics & Prosthetics Science:

- terminology and units
- vector and scalar quantities
- linear/angular motion and motion of a solid body
- resolution of forces and moments in two dimensions
- equations of equilibrium
- free body diagrams
- calculations of centre of gravity and mass
- Newton’s Laws of Motion
- work, power and energy
- strength of materials: stress, strain and Hooke’s Law.

## 2.3 Clinical Subject

The following subject should be examined and studied for 6 semesters.

### 2.3.1 Laboratory and Clinical Practice (6 Semesters – 243 Hours)

The student will be proficient in the following practical areas and clinical applications with an understanding based on the integration of his/her theoretical studies:

- general laboratory practice: use of hand tools, machine tools and materials, component production
- patient examinations and prescription
- measuring and casting, cast rectification, fabrication, fitting, aligning and finishing the following devices:

  - Ankle/partial foot prostheses
  - Trans-tibial prostheses
  - Knee disarticulation prostheses
  - Trans-femoral prostheses
  - Shoe modifications
  - Shoe inserts/foot orthoses
  - Ankle-foot orthoses
  - Knee-ankle-foot orthoses
  - Hip-knee-ankle-foot orthoses
  - Cervical orthoses
  - Cervico-thoraco-lumbo-sacral orthoses
  - Wrist-hand orthoses

## 2.4 Professional Subjects

The following subjects should be included in the curriculum for each semester of study and should be examined accordingly:

### 2.4.1 Biomechanics and Orthotics & Prosthetics Science (6 Semesters – 368 Hours)

The student should have an understanding of the following topics:

- the anatomical planes and reference points of the body
- prosthetic and orthotic measurement techniques
- anatomical joint types, their functions and interaction
- muscle physiology and biomechanics in relation to joint functions
- the interaction of anatomical joints and prosthetic/orthotic joints
- normal human locomotion and the gait cycle
- kinetic and kinematic analysis and the calculation of external and internal force actions
- biomechanics of the lower limb
- lower limb prosthetic components and their application
- stump/socket forces and lower limb socket design
- bench, static and dynamic alignment of lower limb prostheses with reference to biomechanical implications

- pathological gait, its analysis and the application of appropriate orthotic treatment
- body/orthoses forces and interface design
- orthoses for lower limb diseases
- lower limb orthoses for upper motor neurone diseases
- lower limb orthotic components and their application
- biomechanics of the spine and thorax
- orthoses for diseases and deformation of the spine and thorax
- biomechanics of the upper limb
*- upper limb prosthetic fitting, alignment and function
*- upper limb prosthetic components and their application
*- upper limb orthotic fitting, alignment and function
*- upper limb orthotic components and their application

The student requires the above knowledge in order to provide optimal orthotic & prosthetic care to the patient.

* *these subjects should be included according to regional need and demand.*

2.4.2 Orthotics & Prosthetics Laboratory Technology (6 Semesters – 184 Hours)

The student will understand and be able to apply, in the field of orthopaedic technology, the following areas of knowledge:

- hand tools: their selection, use and maintenance
- measuring instruments: use and methods of application
- machine tools: selection, installation, use and maintenance
- welding processes and equipment for metals and plastics
- sewing machines: selection, use and maintenance
- general equipment: ovens, compressors, vacuum pumps, fume and dust extraction apparatus
- workshop layout
- health and safety regulations and practice

2.4.3 Orthotics & Prosthetics Practice (6 Semester - 2100 Hours)

The student should have a thorough knowledge and understanding in the following areas of Orthotics & Prosthetics Science:

Semester 1 & 2

- Basic workshop techniques
  Use of machinery and equipment e.g.
  - sewing machines, vacuum machines, routers etc.
- Orthoses for segment instability
  - Basic casting techniques
- Joint Orthoses
  - Negative mould taking, positive cast rectification, construction, assembly and fitting of:
    - knee orthosis
    - ankle orthosis
    - cervical orthosis - semi-shell
    - spinal support orthoses with posterior pad Orthoses
- For lower limbs

- Negative mould taking, positive cast rectification, construction, assembly and fitting of:
    - ischial load bearing knee-ankle-foot Orthosis
    - ring socket knee-ankle-foot-orthosis (Thomas splint)

- Modular lumbo-sacral orthoses
    - Measuring, fitting and finishing
- Thoraco-lumbo-sacral orthoses
    - Negative mould taking, positive cast rectification, construction, assembly and fitting
- Clinical activity
    - Fitting experience on different pathologies in the clinical environment
- Upper limb orthoses
    - Negative mould taking, positive cast rectification, construction, assembly and fitting of:
        - Opposition orthoses for immobilisation of thumb
        - Wrist-hand positioning orthosis
        - Wrist-hand orthosis
        - Finger extension and flexion orthosis Wrist-hand orthosis for finger flexion/ Extention e.g. Engen

Semester 3 & 4

- Spinal immobilisation orthoses
    - Negative mould-taking, positive cast rectification, Construction and fitting of plastic spinal immobilisation orthosis.
- Spinal correctional orthoses
    - ('Cheneau' or other type)
    - Negative mould-taking, positive cast rectification, Assembly and initial fitting.
- Production of prosthetic components
    - Construction of Solid Ankle Cushion Heel (SACH) Foot; construction of single axis knee/shin components With or without knee lock; repairing worn prostheses.
- Lower limb negative mould-taking
    - Mould-taking techniques for prostheses:
        - Patellar Tendon Bearing (PTB)
        - Kondylar Beitung Munster (KBM) Supra-patellar Tendon Bearing (PTS)
        - Foot amputations (Syme, Piragoff and fore-foot) Trans-femoral
- Trans-tibial and ankle disarticulation prostheses
    - Negative mould-taking, positive cast rectification, construction, assembly, alignment and fitting of:
        - Ankle disarticulation
        - Trans-tibial with supracondylar suspension Trans-tibial with lateral side bar and joints, leather thigh corset
        - Trans-tibial-selective revision
- Trans-femoral prostheses
    - Negative mould-taking, positive cast rectification, construction, assembly, alignment and fitting of prostheses:
        - Trans-femoral with single axis knee and ankle joints and clear check socket

    - Trans-femoral as above with laminated socket Trans-femoral with single axis knee joint, SACH foot and quadrilateral wooden socket
    - Trans-femoral-selective revision

- Clinical activity
    - Prescription, fitting and check-out activities within the clinic team
- Upper limb prosthetics
    - Negative mould-taking, positive cast rectification, construction, assembly and fitting of prostheses:
        - Supracondylar suspension socket
        - Trans-radial
        - Trans-humeral
- Hip disarticulation/transpelvic prostheses
    - Negative mould-taking, positive cast rectification, manufacture and fitting of socket

Semester 5 & 6

- Foot orthoses - arch supports for flat, varus or club foot deformities shoe modifications
    - Tracing/negative mould-taking, positive cast rectification, fabrication, fitting, adjustment and delivery
- Ankle-foot orthoses (short night splint) for club foot
    - Negative mould-taking, positive cast rectification, manufacture, trimming, fitting, and attachment of straps
- Lower limb orthoses
    - Negative mould-taking, positive cast rectification, manufacture and fitting of orthoses:
        - Knee-ankle-foot (long leg night splint) Ankle-foot (drop foot for use in shoe) Ankle-foot (for positioning or unloading) Knee-ankle-foot (for positioning or unloading) Knee-ankle-foot (with ring socket - Thomas splint)
- Lower-limb prostheses
    - Negative mould-taking, positive cast rectification, construction, assembly, alignment and fitting of prostheses:
        - Ankle disarticulation or partial foot Trans-tibial (KBM, PTB or other)
        - Trans-tibial (with side joints and thigh corset)
        - Knee disarticulation (modular with 4-bar knee joint or crustacean construction)
        - Trans-femoral (non suction with auxiliary suspension) Transfemoral (total contact, suction socket) Hip disarticulation (Canadian type)
- Hand orthoses
    - Negative mould-taking, positive cast rectification, manufacture and fitting of orthoses :
        - Wrist-hand (positioning)
        - Hand (thumb immobilisation)
        - Hand (immobilisation of DIP joint)
- Spinal orthoses
    - Negative mould-taking, positive cast rectification, manufacture and fitting of orthoses:

- Thoraco-lumbo-sacral (body jacket from thermoplastic)
- Thoraco-lumbo-sacral (scoliosis-Cheneau type)

- Case history/record keeping
  - Patient information, medical history, current prosthesis, prosthetic delivery

2.5 Legal and ethical obligations

Instruction must be given in the statutory obligations of the student and qualified Orthotists & Prosthetists, as laid down by the Health Professionals Council of South Africa. An understanding of ethical principles should be achieved, in order to help students to practice sound behavior and develop appropriate relationships with colleagues and professionals.

This instruction should be presented in each year of study and reviewed in the final year, with a view to future qualification and/or employment.

## 3. EXAMINATIONS

3.1 Examination in the subjects set out here below will lead to a qualification as an Orthotics & Prosthetics Technologist. Integration of the Primary, Clinical and Professional subjects should be permitted and will take place by means of both formative and summative assessment.

3.1.1 Primary Subjects

Anatomy & Physiology; Pathology; Mathematics & Technical Drawing; Materials Technology; Mechanics; Clinic, Laboratory and Business Management

3.1.2 Clinical Subjects

Laboratory & Clinical Practice

3.1.3 Professional Subjects

The three professional subjects, namely Biomechanics and Orthotic & Prosthetic Science, Orthotics & Prosthetics Laboratory Technology and Orthotics & Prosthetics Practice must be examined as each has relevance to Medical Orthotics & Prosthetics Technology applied to Physical Conditions, and to the Techniques and Activities of Medical Orthotics & Prosthetics Technologists.

3.2 The year mark consists of formative and summative assessment intervals with a final examination mark not exceeding 50% in the final evaluation.

3.3 No candidate shall be considered to have passed the final examination unless he obtains 50 percent (or the equivalent thereof) of the possible maximum for final year subjects.

3.4 An examiner and moderator should participate in the final evaluation of each qualifying subject. The moderator should not have participated in their instruction.

3.5 The examination of subjects may be arranged at the discretion of the academic institution; provided that the professional subjects are included in the final qualifying examinations (see sections 2.4 and 3.1.3).

3.6 No candidate shall be registered with the HPCSA as a Medical Orthotics & Prosthetics Technologist unless:

- he/she has completed at least three years (3600 hours) of successful full-time study as a registered Medical Orthotics & Prosthetics Technology student;

- he/she has passed examinations in all the subjects enumerated in 3.1 above;

- he/she has successfully completed all Primary, Clinical and Professional subjects in the programme;

- he/she has successfully completed the clinical placement, as laid down in 2.3.1. (this time should be fairly equally divided between Orthotic & Prosthetic work. The student must also have the opportunity to practice a variety of techniques and activities. The study of activities must include the following: tangible, intangible, task orientated and socio-emotional);

## 4. MINIMUM REQUIREMENTS OF ACADEMIC INSTITUTIONS

### 4.1 FACILITY

All Academic Institutions wanting to present Diploma in Medical Orthotics & Prosthetics qualifications should have accreditation status with HPCSA.

Adherence to “Standards of Practice for Medical Orthotics & Prosthetics” (Form 266)

### 4.2 EQUIPMENT

The Academic Institution should be equipped with the necessary equipment to train Orthotic & Prosthetic Technology Students according to the minimum standards of training.

### 4.3 CLINICAL SUPERVISION

Criteria on training ratios applicable to Medical Orthotics & Prosthetics Technologists are determined by the relevant academic institution.

## 5. EVALUATION OF TRAINING

Each Academic Institution will be evaluated every four (4) years by evaluators appointed by the HPCSA as prescribed in Form 203.

## 6. PRESENTATION OF THE COURSE

The course may be presented by means of formal lectures, discussions, demonstrations, practicals and clinical practical work. Outcome based education will be the format of delivery supported by evidence based practice.

## 7. LIMITATIONS

Medical Orthotics & Prosthetics Technologists can only perform duties according to their Scope Of Practice.