



INTERNATIONAL SOCIETY FOR PROSTHETICS AND ORTHOTICS

CATEGORY II PROFESSIONAL - ORTHOPAEDIC TECHNOLOGIST

INFORMATION PACKAGE

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1. INTRODUCTION

1.1 Summary

This information package is intended to provide guidance for any country or organisation involved in the establishment of a course which will satisfy the standards of the International Society for Prosthetics and Orthotics (ISPO) in respect of the training of the Category II professional worker (the Orthopaedic Technologist) in the developing world.

It contains a description of the professional profile of the Category II worker (Orthopaedic Technologist). For comparison it also contains at *Appendix A* the Professional Profile of the Category I worker (Prosthetist/Orthotist). It gives an example of an appropriate Code of Ethics. It describes the learning objectives of a course for Category II workers and at *Appendix C* gives an example of an acceptable syllabus. It describes appropriate arrangements for final examinations for a Category II course.

It also outlines arrangements for recognition by ISPO of training programmes and for registration of those who qualify through attendance at such programmes or otherwise meet the same educational and training standards.

1.2 ISPO categorization

A major difficulty encountered in this field is that of nomenclature. Different titles are used in different areas for the same kind of worker and this confusion is made worse by differences introduced by language and translation. This led ISPO to develop a categorisation system which would be based on the levels of education and training provided and would avoid dependence on titles.

The categories may be displayed as follows :

<i>Category I</i>	Prosthetist/Orthotist (or equivalent term) Entry requirement: University entry level (or equivalent) Training: 3/4 years formal structured leading to University Degree (or equivalent)
<i>Category II</i>	Orthopaedic Technologist (or equivalent term) Entry requirement: 'O' level (or equivalent) - the usual requirement for paramedical education in developing countries Training: 3 years formal structured - lower than degree level
<i>Category III</i>	Prosthetic/Orthotic Technician (or equivalent term) Entry requirement: Elementary school diploma Training: On the job

The Society's education philosophy encompasses these three categories and has been concentrated on Category I and II professionals who take part in patient care activities as opposed to Category III workers who are only concerned with manufacture and assembly.

It must be emphasised that this is not an attempt to describe all of those who work in this field throughout the world. It is a description of the levels of education and training which the society believes meantime represent the desirable levels for those involved in patient care in the developed and the developing world respectively and in the support function of manufacture and assembly.

For the industrial world, the Society believes that the Category I professional prosthetist/orthotist should, for the future, be educated and trained at University Degree level or equivalent. It further believes that although there are many different approaches that can lead to this level of training and education any course must consist of :

- a) teaching of theoretical subjects
- b) closely supervised practical instruction
- c) structured and controlled clinical experience

Many industrial countries do not at present satisfy this goal.

It is recognised that at present training in Category I does not exist anywhere in the developing countries and is only available in the industrial world. Despite this it is felt important that some personnel in developing countries should be trained to this level to provide leadership for the prosthetic/orthotic profession and be responsible for education and training within their own countries. It is anticipated, however, that the majority of the clinical service will be provided by Category II personnel who should work under Category I direction, wherever possible.

The concept of Category II responsibilities is regarded as an interim solution for the developing world although it is recognised that a dynamic situation exists.

It is also considered mandatory that Category I and II training is related to clinical service centres.

The question concerning the extent of instruction to be offered in the fabrication of components to Category I and II practitioners has also been considered. In general, industrial world components are not available in the developing world. Although these components can be made by Category II orthopaedic technologists, they can also be made by Category III individuals and/or a variety of craftsmen. Therefore, it is possible for this time consuming activity to be reduced in the training of the Category I and II practitioner, provided that the products available consistently meet appropriate specifications.

As for Category I, there are clearly different approaches which will satisfy the requirements of Category II education and training. The general aims are identified above. Although level and content is different from Category I, an appropriate course will contain the same essential elements. The duration should normally be three years, including one year of prosthetic training, one year of orthotic training and one year in clinical work. Such a course would normally be followed by a year's internship.

It is true that many workers involved in patient care in the developed and the developing world do not meantime fall precisely into these categories (i.e. Category I and Category II respectively). The categories do, however, represent a goal for the workers to achieve and an objective for ISPO in providing and fostering training programmes to assist them in doing so.

1.3 International Association of Orthotists and Prosthetists (INTERBOR).

This package has been accepted by INTERBOR through the mechanism of the ISPO/INTERBOR Joint Education Committee.

2. PROFESSIONAL PROFILE FOR CATEGORY II (ORTHOPAEDIC TECHNOLOGIST)

This professional profile is specific to workers in the developing world. Its origin is in the Guidelines for Training Personnel in Developing Countries for Prosthetic and Orthotic Services (WHO, 1990) and it has been further refined by ISPO to ensure compliance with its categorization system.

2.1 Patient care

Formulation of treatment

- 2.1.1 In the absence of a Category I professional, participates as full member of the clinic team; takes part in the examination and prescription: and advises on the design of the prosthetic/orthotic device interface, suspension and selection of the proper components.
- 2.1.2 Assists and advises on relevant aspects of pre-surgical, post-surgical, medical and therapeutic management of individuals requiring prosthetic/orthotic devices.
- 2.1.3 Records and reports any pertinent information regarding patients and their families, including a determination of expectations and needs.
- 2.1.4 Communicates appropriate information to patients and their families.

Fitting, fabrication and treatment

- 2.1.5 Identifies physical and other relevant characteristics of the patient.
- 2.1.6 Formulates a range of prosthetic or orthotic designs as specified in the curriculum guidelines. This includes selection of materials, components and additional aids.
- 2.1.7 Takes all casts and measurement required for proper fabrication and fitting.
- 2.1.8 Modifies positive and/or negative models and/or layouts of design to obtain optimal fit and alignment.
- 2.1.9 Carries out fitting, static and dynamic alignment and, where appropriate, preliminary training and initial check-out.
- 2.1.10 Performs and/or supervises fabrication of the prosthesis or orthosis.

Evaluation and follow-up

- 2.1.11 Advises the team and participates directly in final check-out and evaluation of fit, function and cosmesis.
- 2.1.12 Instructs the patient or family in the use and care of the device.
- 2.1.13 Takes part in follow-up procedures as well as maintenance, repair and replacement of the appliance.
- 2.1.14 Recognises the need to repeat any of the identified steps in order to optimise fit and function.

2.1.15 Collaborates and consults with others engaged in the management of the patient.

2.2 Management and supervision

2.2.1 Supervises the activity of supporting staff as appropriate.

2.2.2 Manages clinical and laboratory/workshop activities assigned to him, including :

- use and maintenance of tools and equipment
- maintenance of safe working environment and procedures
- inventory and stock control
- personnel matters
- financial matters
- appropriate record keeping
- total quality management

2.2.3 Devises improved job methods for increasing efficiency.

2.2.4 Interacts with professional groups as well as governmental and non-governmental agencies.

2.2.5 Takes part in planning and implementation of technical orthopaedic care systems.

2.3 Training and education

2.3.1 May supervise and take part in the training of individuals in Category II (orthopaedic technologists) and Category III (technicians).

2.3.2 May lecture and demonstrate to colleagues in his profession and other professionals concerned with prosthetics/orthotics and also to community and other interested groups.

2.3.3 Is required to take part in and contribute to the process of continuing professional development.

2.3.4 Keeps abreast of new developments concerning prosthetics/orthotics.

2.4 Community services

2.4.1 Makes a professional contribution to and takes part in community rehabilitation programmes.

2.5 Medical, legal and ethical requirements

2.5.1 Provides patient care within a recognised prosthetics/orthotics code of ethics.

2.5.2 Provides patient care which complies with medical/legal requirements.

3. CODE OF ETHICS

An appropriate code of ethical behaviour is an essential framework for the activities of any professional responsible for the treatment of patients. The following is the code of ethics suggested in the Report of the United Nations Inter-regional Seminar on Standards for the Training of Prosthetists (UN, 1969).

This is, however, only given as an example which satisfies the minimal requirements of such a code. It may require elaboration in different cultural, ethnic or religious settings.

Ethical code for the prosthetists/orthotist

- i) He/she shall observe loyal relations with his/her colleagues and with other members of the clinic team without assuming roles outside his/her own profession.
- ii) He/she shall practise absolute discretion regarding personal matters or knowledge he/she might acquire in his/her professional work.
- iii) He/she, like all other members of the clinic team, should supply service only as a member of that team and respect its conclusions.
- iv) He/she shall collaborate freely in the necessary exchange of information between colleagues and others in the different but related disciplines.
- v) He/she shall strive to perform to the highest possible standard of his/her professional skill.
- vi) He/she shall provide services to patients in a professional manner; personal, financial or commercial interests shall be secondary.
- vii) He/she shall always honestly represent himself/herself as well as his/her services to the patient and all others concerned.
- viii) He/she shall observe similar restrictions in his/her personal relations with patients as are normally accepted by the medical profession.

4. LEARNING OBJECTIVES OF COURSE FOR CATEGORY II

The following outlines the learning objectives of a course for Category II workers in respect of theoretical subjects (4.1 to 4.9) and closely supervised practical instruction (4.10). It should be emphasised that this is a guideline and local variations may still produce an acceptable course. In respect of the supervised practical instruction, regional requirements may influence the emphasis in areas of patient treatment. However, the outline in 4.10 is considered to represent the minimum essential elements of prosthetic and orthotic practice which should be contained within the learning objectives. Where possible, other elements of provision should also be included.

It is also noted again that the course which encompasses these learning objectives will normally be of three years duration full-time study and the entrants will have completed Ordinary ('O') level or equivalent schooling (11 years schooling). This provides guidance as to the expected level of the course and its place within the national educational framework.

An example of a detailed syllabus of an appropriate course is given in *Appendix C*. This is not intended to be a model but only a useful guide as to detailed content and subject breakdown for those involved in course construction.

4.1 Anatomy and physiology

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 stabilisation;
- 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 secretory organs.

The student should have an understanding of the function of individual joints and muscles and be 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 recognise that biomechanical as well as pathological factors must be viewed concurrently with anatomical factors.

4.2 Pathology

The student will have an understanding of the following areas:

- inflammatory diseases;
- degenerative diseases;
- post-traumatic conditions;
- tumours;
- metabolic disorder;
- abnormalities present at birth (congenital deformities);
- aseptic bone necrosis;
- paralysis resulting from nerve lesion;
- 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.

4.3 Biomechanics and prosthetics and orthotics science

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 prosthetic and orthotic care to the patient.

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

4.4 Mathematics

The students will have a knowledge of the following areas of mathematics and their applications to Biomechanics and Prosthetics and Orthotics 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 optimisation and curve sketching;
- integration: simple techniques, evaluation of areas, use of approximation procedures;
- differential equations: first order equations, uses in biological modelling;
- mastery and proper usage of resources such as mathematical tables, formulae and calculators.

4.5 Mechanics

The student will have an understanding of the applications of the following in the area of Biomechanics and Prosthetics and Orthotics 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.

4.6 Materials technology

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 prosthetics and orthotics:

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

4.7 Workshop technology

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.

4.8. Clinic, workshop and business management

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.

4.9 Technical drawing

The student will have knowledge and practice in the following:

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

4.10 Workshop and clinical practice

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 workshop 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

The above represents the essential learning objectives in respect of prosthetic/ orthotic provision for Category II professionals. Where possible, it is desirable to give instructions and/or practice in other levels of provision.

5. EXAMINATION FOR CATEGORY II

The following provides a model of an examination structure for a Category II training course. It is recognised that national or institutional practices or regulations may introduce or require variations. The model is intended generally to be helpful in outlining internationally acceptable standards. More specifically although variations may be acceptable it is provided as a guideline for those institutions which intend to seek ISPO recognition.

5.1 Candidates

Candidates should have completed a full-time course in Orthopaedic Technology at an appropriate educational establishment and have met the requirements to present for the final examinations

or

Candidates should have a minimum of five years professional experience in a prosthetic/orthotic clinic. The candidate should possess a mid-school certificate (11 years schooling) and be able to furnish proof of continued education in such areas as Anatomy, Pathology, Biomechanics and Prosthetics and Orthotics Science, etc.

5.2 Scope of examination

The examination should be comprised of theoretical and practical sections. Each section must be successfully completed in order for the candidate to pass.

5.3 Board of examiners

- 5.3.1 For each examination, a Board of Examiners must be formed whose role is to oversee the documentation, ensure that the examination is representative of the syllabus and certify the examination results.
- 5.3.2 The Examiners shall be appointed and the Examination Board constituted in accordance with national or institutional regulations but normally shall include at least one appropriate medical specialist and one Category I professional. Where possible, a qualified international assessor should be integrated into the local board.

5.4 Theoretical section

- 5.4.1 The theoretical section will examine the candidates knowledge of the following subjects:

- Anatomy and Physiology
- Pathology
- Biomechanics and Prosthetics and Orthotics Science
- Mathematics
- Mechanics
- Materials Technology
- Workshop Technology
- Clinic, Workshop and Business Management
- Technical Drawing.

- 5.4.2 Where an institution is seeking ISPO recognition it is recommended that the theoretical papers are prepared in a multiple choice format to overcome the language barriers sometimes found in developing countries. For guidance these might comprise of approximately 60 questions per subject which should be representative of the balance of the syllabus and last about 90 minutes per subject.

5.5 Practical section

- 5.5.1 The practical section will examine the candidates technical, workshop and clinical skills and will comprise the following tasks:
- prescription, fabrication and fitting of a prosthesis and an orthosis
 - evaluation of practical work
 - presentation of case histories of the subjects
 - cost calculation of the devices
 - technical drawing of the devices, if appropriate.
- 5.5.2 For each candidate the practical examination shall be representative of the clinical content of the curriculum and balanced in complexity between prosthetics and orthotics. For example, a candidate might be asked to provide a prosthesis to a trans-femoral amputee and an ankle-foot orthosis to a subject with a neuromuscular disability. Alternatively, he/she may be asked to provide a prosthesis to a trans-tibial amputee and a knee-ankle-foot orthosis to a patient with poliomyelitis. Should other fittings be proposed they should fall within the same degree of difficulty. In all instances a prosthesis and an orthosis must be included.
- 5.5.3 The examination subjects will normally be determined and indicated to the individual candidates 7 days prior to examination.
- 5.5.4 The candidate is obliged to perform all stages of the fitting and fabrication procedures on his/her own without assistance from other parties. This process must be completed under scrutiny of members of the Board of Examiners.
- 5.5.5 The scrutiny must be undertaken by more than one examiner who will retain responsibility for patient safety.
- 5.5.6 The examiners are required to grade independently all the elements involved.
- 5.5.7 The time allowed during the examination for completion of each subject may exceed the accepted standard within the profession by 30%.
- | | | | |
|------|---------------------------|---|------------------------|
| e.g. | trans-tibial prosthesis | - | 3 working days allowed |
| | knee-ankle-foot orthosis- | | 5 working days allowed |
- 5.5.8 A cost calculation must be made for each device which includes:
- material costs
 - overhead costs
 - workforce costs.
- Profit margins should not be included.
- 5.5.9 The candidate shall present his/her subjects to the examiners and include subject medical history, prescription rationale and outcome.
- 5.5.10 The evaluation of the examination subject cases should encompass all aspects of the work presented.
- 5.5.11 The final result of the practical section is obtained by averaging the results of:
- the practical work
 - the functional outcome
 - the oral presentation.

5.6. Repeat examinations

- 5.6.1 Normally candidates are eligible to repeat any failed portion of the examination under conditions set out by the Board of Examiners no earlier than 6 months after completion of the examination.
- 5.6.2 Candidates may repeat any portion of the examination normally to a maximum of three (3) attempts.

6. ISPO RECOGNITION OF CATEGORY II COURSES

Courses which satisfy the requirements of ISPO with respect to this information package may apply for ISPO Recognition. This is a facility which has already been used by several non-governmental agencies such as Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH and the International Committee of the Red Cross (ICRC). This recognition by ISPO is an assurance to government or other funding agencies that any such approved course of training for orthopaedic technologists meets the accepted international standard.

An applying institution would be asked to complete a questionnaire which seeks detailed information on the course itself and the framework in which it operates. The current questionnaire is attached as *Appendix B*.

If the response displays that the course appears to meet the minimal requirements, ISPO would arrange an inspection, funded by the applying institution and preferably coinciding with a final examination. The inspection would concentrate on such issues as:

- i) entry level to course
- ii) content of course with regards theoretical subjects, workshop practice, clinical practice
- iii) duration of course with regard overall time and hours available for instruction
- iv) recognition of course by the Education and Health authorities
- v) level of training compared with other paramedical professionals
- vi) teaching staff available for theoretical subjects
- vii) staff available for prosthetic and orthotic teaching
- viii) proper examination of all subjects
- ix) high standard of practical and clinical work
- x) failure rates
- xi) access to patients
- xii) access to medical and other paramedical personnel
- xiii) teaching materials
- xiv) facilities such as classrooms, workshops, equipment, clinic areas
- xv) employment prospects of graduates
- xvi) internship arrangements
- xvii) certification of course
- xviii) permanency of course

If the inspection displays that the course meets the requirements in respect of Category II education and training it will be recognised by ISPO for a period of three years. Maintenance of recognition requires a triennial inspection by ISPO.

7. ISPO REGISTRATION

A Category II professional who completes a course which has ISPO recognition will be registered by the institution with ISPO and will thereafter be entitled to describe him or herself as

*ISPO Registered Orthopaedic Technologist
(Category II)*

There is, however, an alternative route to ISPO Registration to which reference is made in the examination procedure (Section 5). A candidate with a minimum of five years professional clinical experience, in possession of a mid-school certificate and able to furnish proof of further education in the areas included in the learning objectives (Section 4) may, by special arrangement, present himself for final examination at an ISPO recognised course. Following successful completion of all parts of the examination such a candidate will also be registered with ISPO by the institution.

This alternative route to qualification is not intended to compromise standards but provide access to a recognised qualification for candidates who have followed an unconventional or fragmented training route. All such arrangements must have the prior approval of ISPO.

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Appendix A

PROFESSIONAL PROFILE FOR CATEGORY I (PROSTHETIST/ORTHOTIST, ORTHOPAEDIC ENGINEER, ORTHOPAEDIC MEISTER ETC.)

The following professional profile has its basis in the Report of the United Nations Inter-Regional Seminar on Standards for the Training of Prosthetists (UN, 1968) - the so-called Holte Report. It has moreover been modified to comply with Guidelines for Training Personnel in Developing Countries for Prosthetic and Orthotic Services (WHO, 1990) and further refined by the Education and Certification Committees of ISPO.

A.1 Patient care

Formulation of treatment

- A.1.1 Participates as full member of the clinic team; takes part in the examination and prescription; and advises on the design of the prosthetic/orthotic device, including the socket or body/device interface, suspension and selection of proper components.
- A.1.2 Assists and advises on relevant aspects of pre-surgical, post-surgical, medical and therapeutic management of individuals requiring prosthetic/orthotic devices.
- A.1.3 Records and reports any pertinent information regarding patients and patients' families, including a determination of expectations and needs.
- A.1.4 Communicates appropriate information to the patients and their families.

Fitting, fabrication and treatment

- A.1.5 Supervises and directs the activities of the orthopaedic technologist and technician in fitting and fabrication.

- A.1.6 Identifies physical and other relevant characteristics of the patient.
- A.1.7 Formulates prosthetic or orthotic designs, including selection of materials, components and additional aids.
- A.1.8 Takes all casts and measurements required for proper fabrication and fitting.
- A.1.9 Modifies positive and/or negative models and/or layout of design to obtain optimal fit and alignment.
- A.1.10 Carries out fitting, static and dynamic alignment and, where appropriate, preliminary training and initial check-out.
- A.1.11 Performs and/or supervises fabrication of the prosthesis or orthosis.

Evaluation and follow-up

- A.1.12 Advises the team and participates directly in final check-out and evaluation of fit, function and cosmesis.
- A.1.13 Instructs the patient or family in the use and care of the device.
- A.1.14 Takes part in follow-up procedures as well as maintenance, repairs and replacement of the appliance.
- A.1.15 Recognises the need to repeat any of the identified steps in order to optimise fit and function.
- A.1.16 Collaborates and consults with others engaged in the management of the patient.

A.2 Management and supervision

- A.2.1 Supervises the activity of supporting staff as appropriate.
- A.2.2 Manages clinical and laboratory/workshop activities assigned to him, including :
 - use and maintenance of tools and equipment
 - maintenance of safe working environment and procedures
 - inventory and stock control
 - personnel matters
 - financial matters
 - appropriate record keeping
 - total quality management
- A.2.3 Devises improved job methods for increasing efficiency.
- A.2.4 Interacts with professional groups and, where appropriate, governmental and non-governmental agencies.
- A.2.5 Takes part in planning and implementation of technical orthopaedic care systems.

A.3 Training and education

- A.3.1 Supervises and conducts the education and training of individuals in Category I (prosthetists/orthotists), Category II (orthopaedic technologists) and Category III

(technicians).

A.3.2 Lectures and demonstrates to colleagues in his profession and other professionals concerned with prosthetics/orthotics and also to other interested groups.

A.3.3 Is required to take part in and contribute to the process of continuing professional development.

A.3.4 Keeps abreast of new developments concerning prosthetics/orthotics.

A.4 Community services

A.4.1 Makes a professional contribution to and takes part in community rehabilitation programmes.

A.5 Research and development

A.5.1 Conducts continuing evaluation of his activities.

A.5.2 Participates in formal evaluation and research programmes.

A.5.3 Participates in scientific/professional meetings and contributes papers to scientific/professional journals.

A.6 Medical, legal and ethical requirements

A.6.1 Provides patient care within a recognised prosthetics/orthotics code of ethics.

A.6.2 Provides patient care which complies with medical/legal requirements.



**QUESTIONNAIRE TO BE COMPLETED
ESTABLISHMENTS SEEKING ISPO RECOGNITION**

General:

Title of Institution _____

Address _____

Name of Director _____

Institution funded by: (✓ please tick)

Government ☐

University ☐

Charitable source ☐

Private source ☐

Affiliation to: (✓ please tick)

Government ☐

University ☐

Other educational establishments ☐

Hospitals ☐

Size of population in geographic region of the Institute or
Prosthetic/Orthotic School

Number _____

Estimated number of disabled requiring prosthetic, orthotic
or other technical aids in that region

Number _____

Main causes of disability (both injury and disease) _____

Outline the nature of any prosthetic/orthotic service you offer _____

How many patients who attend for prosthetic care are available
for teaching purposes?

Hemipelvectomy Number _____

Hip disarticulation Number _____

Trans-femoral Number _____

Knee-disarticulation Number _____

Trans-tibial Number _____

Ankle disarticulation Number _____

Partial foot Number _____

Upper limb Number _____

**GUIDELINE FOR SYLLABUS OF THREE YEAR COURSE LEADING TO
QUALIFICATION
AS ORTHOPAEDIC TECHNOLOGIST**

It should be noted that this is only a recommended guideline intended to assist those involved in course construction. It is based on a 46 week teaching year, with each week having 30 teaching hours. Consequently, hours are allocated to subjects in multiples of 23 in the theoretical content. As there is more flexibility necessary in the practical teaching the total practical content is a multiple of 23.

This course is intended for students who have successfully completed ten or eleven years schooling.

COURSE SUMMARY

FIRST YEAR

Theoretical Subject	Allocated hours
Anatomy / Histology / Physiology	46 46
Materials Technology	115 46
Biomechanics	46 92 23
Mechanics	<u>138</u>
Mathematics	Total 552
Workshop Technology	
General Information - Orthopaedic Technology	67
Technical Drawing	27
	164
Practical Instruction	278
Basic workshop techniques	28
Orthoses for segment instability	30
Joint orthoses	86
Orthoses for lower limbs	<u>148</u>
Modular lumbo-sacral orthoses	Total 828
Thoraco-lumbo-sacral orthoses	
Clinical activity	
Upper limb orthoses	

Allocated hours
46 46 115
46 46 46
92 23

SECOND YEAR

Theoretical Subjects	Anatomy	
	/ Physiology	Total 460
	Materials Technology	
	Biomechanics	34
	Mechanics	44
	Mathematics	88
	Workshop Technology	72
	Technical Drawing	240
	Electrotechnology	264
		88
Practical Instruction		46
	Spinal immobilisation orthoses	44
	Spinal correctional orthoses	
	Production of prosthetic components	
	Lower limb negative mould taking	
	Trans-tibial and ankle disarticulation prosthesis	
	Trans-femoral prosthesis	
	Clinical activity	
	Upper limb prosthetics	
	Hip disarticulation / hemipelvectomy prostheses	
	Total	920

THIRD YEAR

Theoretical Subjects		Allocated hours
	Functional Anatomy	46 92
	Pathology	138 69
	Biomechanics	46 46
	Clinical Science	<u>23 460</u>
	Workshop Technology	
	Orthopaedic Workshop / Business Management	63
	Electrotechnology	63
Practical Instruction		Total 272
	Foot orthoses - arch supports	332
	Ankle-foot orthoses for clubfoot	63
	Lower limb orthoses	105
	Lower limb prostheses	<u>22</u>
	Hand orthoses	920
	Spinal orthoses	
	history/record keeping Case	

Total

FIRST YEAR Content of theoretical subjects

Anatomy/ Histology / Physiology

An introduction to the basic elements of connective tissue, to the structure of the skeleton and joints and the detailed anatomy of the lower limb

	Content	Allocated hours
Cell, tissue and organ systems		
Skeleton, joints		6
Muscular system, physiology		4
Nervous system		5
Skeletal system of the lower limbs		7
Muscle system of the lower limbs		16
		8
Materials Technology	Total	46

An introduction to the composition, properties and treatment of metals and non-metallic materials

used in prosthetic s and orthotics. Biocompatibility and sensitivity to materials

Content

Allocated hours

	3
	12
	5
	8
	4
	10
	4
Total	46

Mechanical testing
Metal
Wood
Leather
Plaster of Paris
Plastics
Adhesives

Biomechanics

An introduction to basic concepts and terminology and detailed consideration of the biomechanics of human locomotion and of lower limb orthoses

	Content	Allocated
Introduction		3
Terminology		3
Planes of the human body and joint function		7
Muscles - introduction		6

Human locomotion	18
Orthotics of the lower limbs	18
general biomechanics - design and construction	
Biomechanics - orthotics of the lower limbs	60
Joint constructions/leg orthoses/night splints/foot orthoses	
Ankle-foot orthoses	
Knee orthoses	
Hip orthoses	
Orthoses for upper motor neuron disease	
	115

Mechanics

An introduction to basic concepts of mechanics and their application in Biomechanics and Workshop Practice

Content	Allocated hours
Kinematics	8
Dynamics	5
Statics	7
Mechanics of motion	9
Momentum and thrust	8
Dynamics of rotating bodies	9
Total	46

Mathematics

Basic mathematics for use in mechanics and biomechanics

Content	Allocated hours
Equations and determinants	8
Algebraic and trigonometric functions	9
Vectors	7
Geometrical theorems and examples of congruence Simple trigonometric equations	4
Geometry (triangles, quadrilaterals, circles) Theories of similarity	7
	8
	3
Total	46

Workshop Technology

The construction, use, care and maintenance of hand and machine tools and of testing and measuring instruments: health and safety in the work environment

Content	
Hand tools	Welding and soldering
Drilling and cutting tools	Machine tools
Files, chisels, saws and metal cutters	Compressors,

Total

vacuum pumps and dust collection equipment	Equipment	Allocated hours
selection and workshop layout		6 8 10
Health and safety in the workplace		16 35 6
		6 5
		92

General Information - Orthopaedic Technology

An introduction to the economics of health provision and to planning and distribution of service: the planning and establishment of orthopaedic fitting services

Content

Economics in the public health sector
Planning and distribution methods
Setting priorities in the public health sector
Instituting an orthopaedic fitting centre in developing countries
Technical orthopaedic care

Allocated hours

	3
	4
	5
	6
	5
Total	23

Technical Drawing

The basic techniques and practice of technical drawing

Content

Introduction to technical drawing
- basic standards Basic
geometrical construction
Projection drawing
Graphical representation:
dimensions and cross-sections

Allocated hours

	10
	34
	50
	44
Total	138

FIRST YEAR Content of practical instruction

Topic	Allocated hours
Basic workshop techniques	
Use of machinery and equipment e.g. sewing machines, vacuum machines. routers etc.	67
Orthoses for segment instability	
Basic casting techniques	27
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	278
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)	28
Modular lumbo-sacral orthoses	
Measuring, fitting and finishing	30
Thoraco-lumbo-sacral orthoses	
Negative mould taking, positive cast rectification, construction, assembly and fitting	
Clinical activity	86
Fitting experience on different pathologies in the clinical environment	
Upper limb orthoses	148
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/ Extension e.g. Engen	

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SECOND YEAR Content of theoretical subjects

Anatomy / Physiology

An introduction to the detailed anatomy and physiology of the spine and trunk, the upper limb and shoulder girdle; basic elements of the skin, cardiovascular, respiratory, digestive and urinary systems; the immune system, the secretory organs and the nervous system

Content	Allocated Hours
Spine and thorax	6
Shoulder girdle and upper limbs	5
Muscular system of the trunk and upper limbs	7
Skin	4
Heart and circulatory system	6
Pulmonary system	5
Digestive system	4
Immune system	3
Endocrine system	3
Nervous system	2
Total	46

Materials Technology

The use of plastics in prosthetics and orthotics, their properties and appropriate welding processes

Content	Allocated hours
Plastic materials	36
Sintering	5
Welding of plastics	5
Total	46

Biomechanics

lower limbs; the biomechanics of spinal orthoses

Content	Allocated hours
Lower limb prosthetics	18
Biomechanics of trans-tibial prostheses	10
Trans-tibial prosthetics - current technology	6
Biomechanics of trans-femoral prostheses	14
Socket shapes and systems	14
Socket technology	6
Prosthetic components	13
General biomechanics of the spine and trunk	15
Biomechanics of spinal orthoses	12
Functional anatomy of the lower limb	7
Total	115

Mechanics

Statics and kinetics and their application in prosthetics and orthotics; physical laws, their mathematical derivation and application; problem solving methods

Content	Allocated hours
Statics offerees in planes and space, momentum	5
Statics of frameworks	3
Work, inertia, friction	6
Stress, strain and Hooke's Law	9
Beam theory	5
Torsion	5
Movements of centre of gravity	7
Kinetics of the system of gravity, vibration (oscillations)	6
Total	46

Mathematics

Numerical sequences and limiting values; differential and integral calculus and their application; functions

Content	Allocated hours
Numerical sequence and limiting values; limiting values of functions	5 6 6 9
Fundamentals of differential and integral calculus	5 6 4 5
Integral calculus	
Use of differential and integral calculus	
Sequences	
Functions with multiple variables	
Logarithmic and exponential functions	
Practical mathematical applications	
Total	46

Workshop Technology

The characteristics, use, care and maintenance of hand and machine tools used in prosthetics and orthotics; workshop safety

Content	Allocated hours
Hand and machine tools	20
Accident prevention in the workplace	4
Machinery and tools for use with plastics	7
Gluing and adhesion	4
Machinery and tools for woodworking	3
Reshaping	3
Grinding and polishing plastics	2
Safety provisions and regulations	3
Total	46

Technical Drawing

Continuation of the fundamentals of graphical representation and its practical application in prosthetics and orthotics

Content	Allocated Hours
Review of first year work	10
Presentation of points of intersection	20
Composition of sketches and working drawings	40
Creation of working drawings (project)	<u>22</u>
Total	92

Electrotechnology

An introduction to the principles of electrical theory and practice and their application in prosthetics and orthotics

Content	Allocated hours
Basic concepts/units	6
DC Circuits	3
Inductance/capacitance	5
AC Circuits Safety	5
T o tal	<u>4</u> 23

SECOND YEAR

Content of practical instruction

Topic	Allocated hours
Spinal immobilisation orthoses	34
Negative mould-taking, positive cast rectification, Construction and fitting of plastic spinal immobilisation orthosis.	44
Spinal correctional orthoses ('Cheneau' or other type)	
Negative mould-taking, positive cast rectification, Assembly and initial fitting.	88
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.	72
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	240
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:	264
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:	88
Supracondylar suspension socket	
Trans-radial	46
Trans-humeral	
Hip disarticulation/transpelvic prostheses	
Negative mould-taking, positive cast rectification, manufacture and fitting of socket	
Total	920
	44

THIRD YEAR

Content of theoretical subjects

Functional Anatomy

Detailed study of the functional anatomy of the upper limbs, the lower limbs and the spine; muscle and joint function and the interaction of the various joints and muscle groups; the relationship between functional anatomy and prosthetic/orthotic treatment

Content	Allocated hours
Joints of the upper limbs	9
Muscles of the upper limbs	8
Joints of the lower limbs	5
Muscles of the lower limbs	11
Joints of the spine	8
Muscles of the spine	5
Total	46

Pathology

Study of systematic pathology and the pathology of orthopaedic diseases, their aetiology, progress, medical and prosthetic/orthotic treatment

Content	Allocated hours
Systematic Pathology	
Inflammatory diseases	9
Degenerative diseases	2
Post-traumatic conditions	2
Tumours	4
Metabolic disorders	3
Congenital deformities	3
Aseptic bone necrosis	3
Paralysis resulting from nerve lesions	3
Circulatory disorders	5
Special Pathology	
Amputation	5
Sudeck syndrome	3
Wry neck/thorax deformities	
Diseases of the spine	6
Diseases of the pelvis and hip	2
and deformities of the lower limbs	2
Diseases of the knee	12
Diseases of the foot	6
Diseases of the shoulder, elbow and hand	3
Review of selected pathologies of the lower limb and spine	4
Total	92

Biomechanics

Detailed study of the biomechanics of pathological gait and of prosthetic fitting of lower and upper limb prostheses

Content	Allocated hours
Pathological gait	28
Lower limb prosthetics	60
Upper limb function and prosthetic replacement	<u>50</u>
Total	138

Clinical Science

The application of anatomy, physiology, pathology and biomechanics to clinical orthopaedics; case histories and clinical examinations, prescription, follow up and rehabilitation; professional ethics

Content	Allocated hours
Examination methods	11
Lower limbs	18
Upper limbs	14
Spinal cord	13
Prescription procedures	6
Follow up examination procedures	2
Professional ethics	<u>5</u>
Total	69

Workshop Technology

The application of static and dynamic alignment procedures to trans-tibial and trans-femoral

Content	Allocated hours
Principles of prosthetic static alignment	15
Alignment of trans-femoral prostheses	9
Alignment of trans-femoral prostheses - errors and consequences	6
Trans-tibial prostheses	3
Negative mould-taking and measurement	9
Alignment of trans-tibial prostheses	<u>4</u>
Total	46

prostheses; mould-taking, casting and construction procedures; finishing

Orthopaedic Workshop Business Management

The fundamentals of business management and their application in the orthopaedic workshop; market driven economy; costing and invoicing, balance sheets; optimization within a given economic framework

Content	Allocated hours
Economic goals, pricing, profitability Management	8
Cost calculations	10
Book-keeping and interp relation Investment information	6
Inventory, book-keeping, direct and indirect costs	5
Cost calculation and case studies	8
	5
	4
Total	46

Electrotechnology

An extension of the application of the principles of electrical theory to prosthetics and orthotics and to workshop practice

Content	Allocated hours
Basic concepts	3
Circuits	3
Transformers	3
Power supplies	3
Amplifiers	5
Feedback	3
Myoelectrodes	2
Safety	1
Total	23

THIRD YEAR

Content of practical instruction

Topic

Foot orthoses - arch supports for flat, varus or club foot deformitiesshoe modifications Tracing/negative mould-taking, positive cast rectification, fabrication, fitting, adjustment and delivery	63
Ankle-foot orthoses (short night splint) for club foot Negative mould-taking, positive cast rectification, manufacture, trimming, fitting, and attachment of straps	63
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)	272
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) Trans-femoral (total contact, suction socket) Hip disarticulation (Canadian type)	332 63
Hand orthoses Negative mould-taking, positive cast rectification, manufacture and fitting of orthoses : Wrist-hand (positioning) Hand (thumb immobilisation) Hand (immobilisation of DIP joint)	 105
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)	 22
Case history/record keeping Patient information, medical history, current prosthesis, prosthetic delivery	

Total **Allocated hours 63**
920

How many patients who attend for orthotic services are available for teaching purposes?

Number _____

Knee-ankle-foot orthoses (leg braces, splints, etc)

Number _____

Ankle-foot orthoses (short leg braces, etc)

Number _____

Spinal orthoses

Number _____

Orthopaedic footwear

Number _____

Other aids - crutches, sticks, walking aids, wheelchairs

Number _____

Upper limb orthoses

Number _____

Are the patients who are fitted by students in the course of their education and training:

solely used as models?

Yes/No

or

are they being fitted as part of their treatment?

Yes/No

Entry Requirements:

Please describe the entry requirements for students to enter the course:

Curriculum Content:

Life Science (including anatomy, physiology, etc)

Hours _____

Mechanics

Hours _____

Biomechanics

Hours _____

Technology (inc electrotechnology, materials science, etc)

Hours _____

Mathematics (and statistics)

Hours _____

Technical Drawing

Hours _____

Prosthetics and Orthotics Science

Hours _____

Workshop Management

Hours _____

Clinical Studies _____ Hours _____

Other _____ Hours _____

_____ Hours _____

_____ Hours _____

Total hours of classroom teaching _____ Hours _____

Total hours of laboratory (workshop) practice _____ Hours _____

Total hours of clinical (patient contact) work _____ Hours _____

Teaching/instruction hours per day _____ Number _____

Days per week _____ Number _____

Weeks per year _____ Number _____

Years to completion of course _____ Number _____

What languages are used in the course of education and training? _____

Assessment and award:

Methods of assessment: (✓ please tick)

Continuous assessment ☐

Written examination ☐

Oral examination (viva voce) ☐

Practical tests ☐

Projects ☐

Describe final examination procedure _____

In the event of failure by candidate what arrangements are there for re-sitting examinations or repeating part of course

Nature of qualification awarded at the end of education and training _____

Title given to successful candidate _____

In the view of the Institution is that title related to : (✓ please tick)

Prosthetist/Orthotist ☐

Orthopaedic meister ☐

Orthopaedic technologist ☐

Other ☐

Facilities:

Class Rooms	Number _____	Dimensions _____
Instructional Laboratories/Workshops	Number _____	Dimensions _____
Consulting Rooms	Number _____	Dimensions _____
Measuring and Casting Rooms	Number _____	Dimensions _____
Plaster Rooms	Number _____	Dimensions _____
Orthotics Workshops	Number _____	Dimensions _____
Prosthetics Workshops	Number _____	Dimensions _____
Plastics Workshops	Number _____	Dimensions _____

Employment:

What is known of the professional placement of your graduates in your own country?

Please specify: (e.g. in government institutions or hospital, in Universities or private facilities?) _____

What is their salary and status equivalent to? (✓ please tick)

Doctor ☐

Therapist ☐

Nurse ☐

Bench worker ☐

What is known of the professional placement of your graduates in other countries?

Please specify here _____

What is their salary and status equivalent to? (✓ please tick)

Doctor ☐

Therapist ☐

Nurse ☐

Bench worker ☐

Fees:

Annual fee for course of education and training _____ For _____ years

Paid by: (✓ please tick)

Student ☐

Government ☐

Charity ☐

Other ☐

Updated 3 April 2002