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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 I professional worker (Prosthetist/Orthotist).

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

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:

- **Category I**
  - Prosthetist/Orthotist (or equivalent term)
  - Entry requirement: University entry level (or equivalent, 12/13 years schooling)
  - Training: 3/4 years formal structured leading to University Degree (or equivalent)

- **Category II**
  - Orthopaedic Technologist (or equivalent term)
  - Entry requirement: ‘O’ level (or equivalent - the usual requirement for paramedical education in developing countries – normally 11 years schooling)
  - Training: 3 years formal structured - lower than degree level

- **Category III**
  - 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 normally exist in the developing countries and is mostly 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.

There are clearly different approaches which will satisfy the requirements of Category I education and training. The general aims are identified above. An appropriate course will contain the same essential elements. The duration should normally be three or four years. 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.

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

The following professional profile has been developed by ISPO over a number of years. It was based on the report of the United Nations Inter-Regional Seminar on Standards for the Training of Prosthetists (UN, 1968) - the so-called Holte Report. It was modified to comply with Guidelines for Training Personnel in Developing Countries for Prosthetic and Orthotic Services (WHO, 1990). It was further refined by the Education Committee of ISPO after a period of consultation (ISPO, 1998). It was updated at the WHO/ISPO Consultation for Training Personnel in Developing Countries for Prosthetics and Orthotics Services (2003). Lastly, it was finalised at the ISPO European Conference for Education in Prosthetics and Orthotics (2004).
2.1 Patient care

**Formulation of treatment**

2.1.1 Participates as full or equal member of the clinic team; takes actively part in the examination and prescription; and designs the prosthetic/orthotic device, including the socket or body/device interface, suspension and selection of 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 patients’ families, including a determination of expectations and needs.

2.1.4 Communicates appropriate information to the patients and their families.

2.1.5 Guarantees the full inclusion of the patient or customer in the treatment planning and decision making.

**Fitting, fabrication and treatment**

2.1.5 Supervises and directs the activities of individuals in Category-II (orthopaedic technologist) and Category-III (orthopaedic technician) in fitting and fabrication.

2.1.6 Identifies physical and other relevant characteristics that may effect the treatment of the patient.

2.1.7 Formulates prosthetic or orthotic designs, including selection of materials, components and assistive mobility devices as well as seating and advising on the provision of wheelchairs.

2.1.8 Takes all casts and measurements that are necessary for proper fabrication and fitting.

2.1.9 Modifies positive and/or negative models and/or layout of design and/or digital images to obtain optimal fit and alignment.

2.1.10 Carries out fitting, static and dynamic alignment and, where appropriate, preliminary training and initial check-out.

2.1.11 Performs and/or supervises fabrication of the prosthesis or orthosis.

**Evaluation and follow-up**

2.1.12 Advises the team and participates directly in final check-out and evaluation of fit, function and cosmesis.

2.1.13 Instructs the patient or family in the use and care of the device.

2.1.14 Takes part in follow-up procedures as well as maintenance, repairs and replacement of the appliance.

2.1.15 Recognises the need to repeat any of the identified steps in order to optimise fit and function.

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

2.2 Management and supervision
2.2.1 Supervises the activity of support staff as appropriate.

2.2.2 Manages clinical and laboratory/workshop activities assigned to him/her, 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 Identifies and introduces improved job methods for increasing efficiency.

2.2.4 Interacts with professional groups and, where appropriate, governmental and non-governmental agencies.

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

2.3 Training and education

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

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

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

2.3.4 Critically evaluates new developments in prosthetics/orthotics for inclusion in a teaching syllabus.

2.3.5 Keeps up to date with new teaching techniques.

2.4 Community services

2.4.1 Makes a professional contribution to and takes part in community rehabilitation programmes related to prosthetics/orthotics.

2.5 Research and development

2.5.1 Conducts continuing evaluation of his/her activities.

2.5.2 Develops and actively participates in formal evaluation and research programmes.

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

2.5.4 Use outcome measures to review treatment procedures to determine best practice.

2.6 Medical, legal and ethical requirements
2.6.1 Provides patient care within a recognised prosthetics/orthotics code of ethics.

2.6.2 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 I

The following outlines learning objectives of a course for Category I workers in respect of closely supervised practical instruction (4.1) and clinical practice (4.2) followed by theoretical subjects (4.3 to 4.12). It should be emphasised that this document defines a set of key objectives, but does not include additional subjects that may be required to meet cultural, legal or customary requirements local higher education standards. In respect to the supervised practical instruction, regional requirements may also influence the emphasis on particular pathologies in areas of patient treatment. Within the learning objectives it is recognised that there are different levels of learning, every attempt has been made to reflect the necessary level of learning within each of the subject areas presented.

It should also be noted that the course which encompasses these learning objectives will normally
be of three or four years duration full-time study and the entrants will have satisfied University entrance requirements (12/13 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.

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*Figure 1.1 - Organisation of Category I Subjects*
CORE SUBJECTS

Core Practical Subjects

4.1 Prosthetic and Orthotic Science – Practical

The basis of “Prosthetics and Orthotics Science – Practical” is the closely supervised practical instruction of students in the manufacturing and fitting of devices and in the clinical and technical aspects of prosthetic and orthotics. Upon conclusion of the subject students should be able to demonstrate basic skills necessary to deliver devices to patients. S/he will understand and appreciate the choice of treatment/rehab planning, device design, component selection and broader prescription methodology. S/he will have an appreciation of the client centred approach, understanding the clients role and the role of or her health care professional’s role in making these choices. This should include the supervised manufacture and fitting of all common devices and at least exposure to the range of devices not routinely seen in clinical practice.

Upon completion of this subject the student will be able to:

- 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 orthotic or prosthetic solution using information from the patient assessment, other members of the rehabilitation team, medical charts, etc.
- Communicate and discuss patient goals and expectations and discuss and debate the orthotic or prosthetic management with the patient, co-workers and other members of the rehabilitation team.
- Reliably measure and capture a positive cast or image of clients’ appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
- Create the final design of the orthosis through modification of the positive cast and/or tracing of the body part or, when indicated, measure and fit prefabricated devices.
- Identify, prescribe and justify selection of appropriate materials and componentry in the construction of the device.
- Construct the device using appropriate fabrication techniques in preparation for the initial fitting.
- Fit the device to the patient using static and dynamic functional criteria established from the original assessment.
- Evaluate the quality of the device fit to ensure the appropriate interface contouring, force application and trimlines.
- Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
- Assess and solve orthotic and prosthetic problems as part of long term patient care.
- Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
- 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 client and/or caregiver on use, care and function of the device.
- Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the client at the centre.

The following areas of practice should be addressed:-
4.2 Clinical Practice

The student will have experience in the clinical environment of supplying prostheses and orthoses to patients undergoing treatment. This experience should cover as wide a range as possible but with emphasis on the major levels of provision. The aim is to develop skills in:

- assessment and prescription;
- communication;
- clinical provision of prostheses and orthoses;
- manufacture of prostheses and orthoses;
- interpersonal relationships;
- professional activity;
- communication;
- organisation and management;
- clinical research.
Contributing too and learning from the clinic team.

Where the clinical practice takes place in centres other than the main teaching institution such clinical placement centres must satisfy specified standards of the teaching institution and the student’s work must be supervised by a Category I professional who is accountable to the school.

Core Theoretical Subjects

4.3 Prosthetic and Orthotic Science – Theory

This subject is delivered in a coordinated manner with the Practical part of the Orthotic and Prosthetic Science course. The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

Learning Objectives:

Upon completion of this subject the student will be able to:

- Compare and contrast strategies for clinical assessment of patients and describe appropriate investigative techniques including patient history taking and physical examination.
- Recognize and describe the signs and symptoms of the most common pathologies which require orthotic and prosthetic solutions including, aetiology, clinical presentation, prognosis and appropriate device management.
- Have an understanding of clinical conditions that may indirectly impact on the clients ability to successfully rehabilitate using the device.
- Demonstrate empathy between P&O theory and the environment in which the client is situated.
- Distinguish between the physical characteristics of the limbs and discuss the relative implication for device design.
- Describe and compare temporospatial and kinematic characteristics of normal and pathological gait and use this information to justify the selection and design of appropriate devices.
- Discuss biomechanical force systems and use these principles in generating an appropriate orthotic or prosthetic prescription.
- Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.
- Compare and contrast the functional characteristics of prosthetic and orthotic components.
- Formulate appropriate prosthetic and orthotic prescriptions for a wide range clinical situations.
- Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist/prosthetist.
- Identify and describe common surgical techniques and how they may influence prosthetic and orthotic fit and design.

4.4 Anatomy and physiology

Upon completion of a category one course in prosthetics and orthotics, student should be able to
- describe and explain cell biology;
- explain and give examples of basic tissues, their properties and structure;
- compare and contrast the structure and properties of biological substances (ie: blood, lymphatic fluids, serum);
- describe parts and organs of the body by systems including:
  - integumentary system
  - skeletal system
  - articular system
  - muscular system
  - nervous system
  - circulatory system
  - respiratory system
  - urinary system
  - reproductive system
  - endocrine system
  - digestive system
- explain the process of human growth and development;
- demonstrate competence in identifying and differentiating between surface anatomical structures of the lower limb, upper limb spine and trunk;
- Understand the inter-relations between the systems described. (I mean, they should know origin, insertion, nerve connection and blood supply of each muscle,.., that’s just one example)
- describe and relate the structure and function of the upper and lower limbs to clinical pathologies;
- Synthesise and apply the principles of anatomy and physiology to describe the human locomotor system.

The student should understand the function of individual joints and muscles and be proficient in explaining their interaction. He/she should be knowledgeable in the area of clinical conditions 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.

### 4.5 Pathology

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

- describe the basic pathological processes that underlie disease (eg: cell injury and necrosis, inflammation and healing, ischemia, infarction and neoplasia);
- apply knowledge of basic pathological processes to explain the etiology, pathogenesis, structural and functional manifestations of diseases commonly encountered in clinical practice, including relevant conditions affecting locomotion and body systems (circulatory system, respiratory systems, musculoskeletal system and nervous system.
- discuss the pathophysiology of abnormalities present at birth (congenital deficiencies).

The student should be able to describe and contrast the aetiology and progression of diseases and to identify early signs and symptoms of conditions that are commonly encountered by prosthetists/orthotists. In addition, s/he should be able to advise on care and appropriate treatment options. Specific conditions covered should include:

- demyelination disorders;
- skin disorders;
- upper motor neurone disorders;
- lower motor neurone disorders;
- diabetes mellitus
- Hansen disease
- peripheral vascular disease;
- age related disabilities;
- spinal injuries;
- joint and skeletal disorders;
- trauma and post traumatic conditions
- overuse syndromes

Have a basic understanding of surgical techniques commonly encountered by the clinical team. Students should be encouraged to witness relevant surgeries and have a baseline understanding of post surgical care.

4.6 Mechanics and biomechanics

Students should be able to;

**Mechanics**

- Demonstrate an ability to utilize appropriate terminology and units to describe mechanical principles.
- Derive free body diagrams in order to describe clinical problems and generate treatment solutions.
- Apply the mechanical principles of statics and dynamics to quantify and explain linear and angular motion of the human body
- Apply the concepts of stress and strain in the analysis of basic structural elements.
- Determine and draw diagrams for internal forces and bending moments (axial forces, shear forces, moments and torques) in a structural member.
- Explain the principles of composition and resolution of forces and use these principles to solve clinical problems
- Discuss the concepts of work energy and power
- Explain the principles of fluid mechanics and describe how the principles can be applied in clinical situations.
- Explain mechanisms underlying failure of structures under deformation.

**Biomechanics**

The understanding of Bio-mechanical principles of Prosthetics and Orthotics will be the foundation of the work of the graduate P&O practitioner. It is essential they have a sound theoretical knowledge of the subject and are able to demonstrate the rigorous application of these principles to practical P&O situations and in the analysis of those situations

- Demonstrate an ability to apply principles of tissue mechanics to explain the principles of P&O treatment, (involving various force systems) and the practical problems encountered in prosthetics and orthotics
- Use biomechanical terminology to describe position and motion of the human body
- Discuss mechanical principles governing human motion
- Utilise temporospatial, kinematic and kinetic information to distinguish between normal and abnormal function of the upper limbs, lower limbs and spine.
- Analyse the forces at a skeletal joint for various static and dynamic activities
- Demonstrate the ability to analyse forces and moments applied to the body by prosthetic
and orthotic devices.

- Apply biomechanical principles to generate optimal solutions to clinical problems in prosthetics and orthotics.
- Understand the concepts of differentiation and integration and evaluate derivatives and integrals of a function.

### 4.7 Clinical Studies

Students should be able to perform the following tasks related to clinical practice.

- Describe and discuss the principles underlying evidence-based practice.
- Compare, contrast and criticise relevant literature in order to determine the best available evidence regarding treatment modalities for specific clinical problems.
- Recognise members of the clinic team and identify benefits associated with a team approach.
- Describe and discuss theoretical principles of rehabilitation.
- Describe theories related to the psychology of loss and disability.
- Demonstrate safe methods for handling and moving patients.
- Describe and discuss issues related to medical ethics.
- Demonstrate and appreciate of emotional intelligence.
- Apply client-centered service delivery.
- Manage gender and cultural awareness.
- Comply with cross-infection and hygiene standards.
- Understand the mechanism for “care in the community” and to comprehend how post rehab is synthesized.

### 4.8 Materials Technology

Upon completion of a prosthetics and orthotics program, students should be able to:

- Explain the important properties of various types of materials: metals, ceramics, polymers, and composites.
- Describe the relationships that exist between the structural elements of these materials and their characteristics.
- Explain mechanical and failure behavior of these materials, along with techniques used to improve the mechanical and failure properties in terms of alteration of structural elements.
- Describe the basis for the selection of different materials for specific prosthetic and orthotic applications.
- Demonstrate knowledge of toxicity and safety issues associated with the use of specific materials.
SECONDARY SUBJECTS

4.9 Clinic, workshop and business management

Students should

- possess knowledge and understanding of techniques related to the design, planning, control and improvement of service and manufacturing operations.
- demonstrate basic knowledge of business management practices such as cost calculations and accounting processes.
- address issues related to clinic management including, appointment systems and record keeping.
- discuss the importance of quality control and workflow management.
- Apply appropriate inventory management protocols
- Understand and discuss the benefits associate with the use of quality assurance systems
- Understand the organization of the workplace environment.

4.10 Workshop technology

Students should have competence in practising effectively and safely within a workshop environment. Students should;

- be familiar with the occupational health and safety policy and procedures in the workplace.
- demonstrate proficiency in the use of hand tools and machine tools commonly used in the fabrication of orthopaedic devices.
- describe the principles of computer aided design computer aided manufacture

4.11 Electrotechnology

The student will have knowledge of basic principles of electricity with particular reference to applications in prosthetics, orthotics and workshop practice. This should include;

- DC circuits;
- inductance and capacitance;
- AC circuits;
- power supplies;
- amplifiers;
- feedback;
- interference rejection techniques;
- myoelectrodes;

4.12 Research methods in health

The student will have a knowledge of the following areas of mathematics and their application to mechanics, biomechanics and prosthetics and orthotics:

- Analyse, describe, interpret and present information contained in various data sets
- To examine the concepts of estimation and hypothesis testing with applications to population proportions, means, variances
- perform effective descriptive statistical analysis as well as statistical inference for a variety of mainstream applications
- Understand probabilistic reasoning and compute probabilities for simple problems.
• Use appropriate empirical and probability distributions to model data.
• Interpret the output from regression analysis and be aware of limitations of standard interpretations.
• Determine the appropriate statistical tests to use for a variety of research questions.
• Formulate an appropriate research plan in order to solve a clinical problem.
• Conduct a basic research study in order to solve a clinical problem.
• Synthesise results of a research study and communicate them in written and oral form.

5. EXAMINATION FOR CATEGORY I

The following provides guidelines to the essential features of the examination for a Category I training course. National or institutional practices or regulations may impose constraints on the procedures. However normally the essential features must be incorporated by those institutions seeking ISPO recognition.

5.1 Scope of examination

All courses will have three elements: theoretical, prosthetics and orthotics practice (closely supervised practical instruction) and clinical practice. Each of these elements must be assessed and each must be completed successfully in order for the candidate to pass.

5.2 Board of Examiners

5.2.1 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.

5.2.2 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.

5.3 Examination procedures

5.3.1 Theoretical section

The theoretical assessment will examine the candidates’ knowledge of the following subjects:

* Anatomy and Physiology
* Pathology
* Mechanics and Biomechanics
  - Mathematics and Statistics
  - Materials Technology
  - Workshop Technology
  - Clinic, Workshop and Business Management
  - Graphical Communication
* Prosthetics and Orthotics Science
  - Clinical Studies
  - Electrotechnology
  - Computer Studies

It is expected that there will be greatest emphasis on successful completion of those subjects marked *.
5.3.2 Prosthetics and orthotics practice (closely supervised practical instruction).

The practical assessment will examine the candidates’ technical, workshop and clinical skills. It will be representative of the clinical content of the curriculum, balanced in complexity between prosthetics and orthotics and both prosthetics and orthotics must be successfully completed.

5.3.3 Clinical practice

The clinical practice assessment will examine the candidates’ skills in the clinical environment in the treatment of people requiring prosthetic and orthotic provision. The assessment will examine the candidate in respect of:

* patient assessment and prescription;
  - manufacture;
* clinical provision of protheses and orthoses;
  - interpersonal relationships;
  - professional activity;
* communication;
  - organisation and management;
* clinical research.

The emphasis of assessment and successful completion will be in those areas marked *. Performance in both prosthetics and orthotics must be satisfactory. The clinical practice assessment will be representative of the whole range of clinical provision but with emphasis on the major levels of provision.

Where the clinical practice is carried out in centres other than the main teaching institution, if assessment is carried out by clinical staff not belonging to the institution, the clinical staff involved in assessment must be Category I professionals and must carry out the assessment within the framework specified by the teaching institution.

6. **ISPO RECOGNITION OF CATEGORY I COURSES**

Courses which satisfy the requirements of ISPO with respect to this information package may apply for ISPO Recognition. This recognition by ISPO is an assurance that any such approved course of training for prosthetist/orthotists 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
xix) national recognition

If the inspection displays that the course meets the requirements in respect of Category I 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 I 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

\[
\text{ISPO Registered Prosthetist/Orthotist (Category I)}
\]

8. REFERENCES AND BIBLIOGRAPHY


ISPO (1985). Report of ISPO Workshop on prosthetics and orthotics in the developing world with respect to training and education and clinical services, Moshi, Tanzania 6-12 May 1984. / edited by NA Jacobs, G Murdoch. - Copenhagen, Denmark: ISPO.


Appendix A

A. 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.

A.1 **Patient care**

*Formulation of treatment*

A.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.

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 their families, including a determination of expectations and needs.

A.1.4 Communicates appropriate information to patients and their families.

*Fitting, fabrication and treatment*

A.1.5 Identifies physical and other relevant characteristics of the patient.

A.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.

A.1.7 Takes all casts and measurement required for proper fabrication and fitting.

A.1.8 Modifies positive and/or negative models and/or layouts of design to obtain optimal fit and alignment.

A.1.9 Carries out fitting, static and dynamic alignment and, where appropriate, preliminary training and initial check-out.

A.1.10 Performs and/or supervises fabrication of the prosthesis or orthosis.

*Evaluation and follow-up*

A.1.11 Advises the team and participates directly in final check-out and evaluation of fit, function and cosmesis.

A.1.12 Instructs the patient or family in the use and care of the device.

A.1.13 Takes part in follow-up procedures as well as maintenance, repair and replacement of the appliance.
A.1.14 Recognises the need to repeat any of the identified steps in order to optimise fit and function.

A.1.15 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 as well as 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 May supervise and take part in the training of individuals in Category II (orthopaedic technologists) and Category III (technicians).

A.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.

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 Medical, legal and ethical requirements

A.5.1 Provides patient care within a recognised prosthetics/orthotics code of ethics.

A.5.2 Provides patient care which complies with medical/legal requirements.
QUESTIONNAIRE TO BE COMPLETED BY EDUCATION AND TRAINING 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 _________

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

Student Entry Requirements:
Schooling  Years ________
Required Subjects
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

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 ________

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
the 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 _______
Engineering Workshops Number _______ Dimensions _______
Other Fabrication Workshops Number _______ Dimensions _______

Description ____________________________________________________________
Library facilities (describe) ________________________________________________________________

Research facilities (describe) _____________________________________________________________

**Education and Training Staff**

**Instructors:**
- Prosthetists (orthopaedic meisters) Category I: Number ________
- Orthotists (orthopaedic meisters) Category I: Number ________
- Orthopaedic technologists Category II: Number ________
- Instructors in fabrication Category III: Number ________
- Physicians/Surgeons: Number ________
- Therapists (physical and occupational): Number ________
- Bioengineers: Number ________
- Engineers: Number ________

**External Lecturers:**
- Physicians: Number ________
- Surgeons: Number ________
- Therapists: Number ________
- Orthotists: Number ________
- Prosthetists: Number ________
- Bioengineers: Number ________
- Engineers: Number ________

**Students:**

<table>
<thead>
<tr>
<th>Number of students starting in each of these years</th>
<th>1993</th>
<th>1994</th>
<th>1995</th>
<th>1996</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
</table>

Describe the nature and duration of any internship arrangement ______________________________________

**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
Appendix C

GUIDELINE FOR SYLLABUS OF FOUR YEAR UNIVERSITY COURSE LEADING TO QUALIFICATION AT CATEGORY I LEVEL (PROSTHETISTS/ORTHOTIST)

It should be noted that this is only a guideline intended to assist those involved in the construction of a University or College based course. It is constructed on three campus based years, each of 42 weeks and one clinically based year of 46 weeks. However the basis of any course should be the Learning Objectives specified in Section 4.

This course is intended for students who have successfully completed science based schooling of twelve or thirteen years.

COURSE SUMMARY

FIRST YEAR

Theoretical Subjects: Allocated hours
- Life sciences I: 120
- Mechanics and Biomechanics I: 96
- Prosthetics and orthotics science I: 48
- Clinical studies I: 72
- Mathematics and statistics: 72
- Graphical communication: 72
- Electrotechnology: 72

Total: 552

Practical Instruction
- Introductory workshop practice: 174
- Trans-tibial prostheses: 120
- Foot-orthoses: 90
- Ankle-foot-orthoses: 60

Total: 444

SECOND YEAR

Theoretical Subjects: Allocated hours
- Life sciences II: 120
- Mechanics and biomechanics II: 120
- Prosthetics and orthotics science II: 48
- Clinical studies II: 72
- Computer studies: 24

Total: 384

Practical Instruction
- Ankle-foot-orthoses: 114
- Trans-femoral prostheses: 108
- Knee and ankle disarticulation prostheses: 120
- Upper limb prostheses: 120
- Upper limb orthoses: 60
- Spinal orthoses: 60

Total: 582

THIRD YEAR

Theoretical Subjects: Allocated hours
- Life sciences III: 120
- Mechanics and biomechanics III: 108
- Prosthetics and orthotics science III: 48
- Clinical studies III: 72
- Materials technology: 72

Total: 420

Practical Instruction
- Hip disarticulation prostheses: 66
- Knee-ankle-foot-orthoses: 162
- Spinal orthoses: 60
- Upper limb prostheses: 144
- Revision
  - Lower limb prostheses: 30
  - Lower limb orthoses: 30
  - Spinal orthoses: 30
  - Upper limb orthoses: 30

Total: 30
FOURTH YEAR

CLINICAL PRACTICE
Structured and Controlled Clinical Experience
Prosthetics 805
Orthotics 805

Ankle-foot-orthoses 30

Total 582
FIRST YEAR

Content of theoretical subjects

Life Sciences I

The aim of the introductory section of the course is to provide a background in cell biology, anatomy and physiology. The more detailed structure and functioning of the locomotor system are studied before examining the detailed anatomy of the lower limb. Laboratory work includes demonstrations and microscopic work to facilitate understanding of the relationship between structure and function in living systems. Experimental physiology is also used to illustrate the lecture course. Practical work in anatomy consists of demonstrations.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Anatomy</strong></td>
<td></td>
</tr>
<tr>
<td>definition of anatomical terms; regions of the body; body cavities and their contents; functional arrangement of organs into systems – related to the properties of life.</td>
<td>Lectures 6 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorials/Laboratories 4 hours</td>
</tr>
<tr>
<td><strong>Chemicals of Life</strong></td>
<td></td>
</tr>
<tr>
<td>structure and properties of important biological substances; functions.</td>
<td>Lectures 8 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorials/Laboratories 4 hours</td>
</tr>
<tr>
<td><strong>Cell Biology</strong></td>
<td></td>
</tr>
<tr>
<td>cell ultrastructure and cell biochemistry.</td>
<td>Lectures 8 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorials/Laboratories 4 hours</td>
</tr>
<tr>
<td><strong>Basic Tissues</strong></td>
<td></td>
</tr>
<tr>
<td>structure and functions; arrangement in organs.</td>
<td>Lectures 7 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorials/Laboratories 8 hours</td>
</tr>
<tr>
<td><strong>Review of Physiology of Body Systems</strong></td>
<td></td>
</tr>
<tr>
<td>alimentary, respiratory, circulatory (to include body fluids) renal, reproductive, integumentary, endocrine and nervous.</td>
<td>Lectures 7 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorials/Laboratories 6 hours</td>
</tr>
<tr>
<td><strong>Locomotor System</strong></td>
<td></td>
</tr>
<tr>
<td>structure and function of bones, joints and muscles; arrangement and function of the somatic nervous system.</td>
<td>Lectures 14 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorials/Laboratories 6 hours</td>
</tr>
<tr>
<td><strong>Anatomy of Lower Limb</strong></td>
<td></td>
</tr>
<tr>
<td>survey of structure and function of lower limb; detailed structure and function of bones and joints of lower limb; blood supply to lower limb; lumbo-sacral plexus and main nerves to lower limb; origins, insertions, actions and nerve supply of musculature of lower limb; surface anatomy of lower limb.</td>
<td>Lectures 22 hours</td>
</tr>
<tr>
<td></td>
<td>Tutorials/Laboratories 16 hours</td>
</tr>
<tr>
<td><strong>Total Lectures</strong></td>
<td>72 hours</td>
</tr>
<tr>
<td><strong>Total Tutorials/Labs.</strong></td>
<td>48 hours</td>
</tr>
</tbody>
</table>
Mechanics and Biomechanics I

The mechanical properties and behaviour of materials and devices which are used in treating patients, and the interaction between device and patient. The course comprises a series of lectures, supported by supervised tutorial periods and practical laboratory sessions.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundation Material</strong></td>
<td></td>
</tr>
<tr>
<td>Units, dimensional homogeneity, scalar/vector quantities, co-ordinate systems, Newton’s laws. Resolution and summation of forces and moments in two and three dimension, equivalent force systems, free body diagrams, equations of equilibrium, plane and space frame analysis. Linear/angular motion, uniform acceleration, friction, inertia, moment of inertia, dynamic equilibrium (translation/rotation), energy, momentum. Stress and strain (graphic solution), constitutive equations.</td>
<td>Lectures 30</td>
</tr>
<tr>
<td><strong>Human Movement</strong></td>
<td></td>
</tr>
<tr>
<td>Ranges of movement (lower/upper limbs and spine), normal gait (introduction to kinematics, kinetics and EMG studies), introduction to amputee and pathological gait. Kinematic analysis of limbs.</td>
<td>Lectures 7</td>
</tr>
<tr>
<td><strong>Tissue Mechanics</strong></td>
<td></td>
</tr>
<tr>
<td>Introduction to relevant biological tissues and their mechanical properties.</td>
<td>Lectures 3</td>
</tr>
<tr>
<td><strong>Lower Limb Prosthetics</strong></td>
<td></td>
</tr>
<tr>
<td>General socket biomechanics/biomechanical principles of cast rectification, BK socket biomechanics, trans-tibial alignment biomechanics, trans-femoral socket biomechanics, trans-femoral alignment biomechanics.</td>
<td>Lectures 5</td>
</tr>
<tr>
<td><strong>Lower Limb Orthotics</strong></td>
<td></td>
</tr>
<tr>
<td>Foot biomechanics – analysis of joint forces (normal, pathological, effects of footwear).</td>
<td>Lectures 3</td>
</tr>
</tbody>
</table>

| Total Lectures          | 48 |
| Total Tutorials/Labs.   | 48 |
Prosthetics and Orthotics Science I

General note to Prosthetics and Orthotics Science I, II and III:

The course is divided into sections as indicated. Each section comprises relevant biomechanics, together with anatomy and pathology of disability, description of prosthetic, orthotic devices, patient/device matching and fitting principles. Each section is followed by practical instruction in the same subject.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory workshop practice</td>
<td>18</td>
</tr>
<tr>
<td>Trans-tibial prosthetics</td>
<td>12</td>
</tr>
<tr>
<td>Foot and foot-orthotics</td>
<td>10</td>
</tr>
<tr>
<td>Ankle-foot-orthotics</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
</tr>
</tbody>
</table>

Clinical Studies I

General note to Clinical Studies I, II and III: the clinical studies programmes comprise the following four sections:

1. Lectures
These lectures are intended to present new material, which the student will not receive during other teaching modules.

2. Lectures/Clinical Demonstrations
These lectures/clinical demonstrations are intended to link the Life Sciences and Prosthetic/Orthotic (P/O) teaching modules. The same topics may be covered in the Life Science programme but only from a body-systems point of view. Within this programme a clinician will be asked to speak about the clinical manifestations of the condition under consideration, of the prognosis, associated problems, the role of P/O devices in the management of the patient, the objectives and expected outcome of P/O treatment, and selection of P/O devices.

Each session will comprise a one-hour lecture to cover the above material followed by a two-hour presentation of patients to illustrate the problems discussed in a clinical situation. The topics to be covered have been selected following discussion with the team teaching the Life Science module and with due regard to the P/O programme.

3. Patient Contact Session
These introductory sessions will familiarise the student with the protocol and techniques of patient contact and assessment of the patient’s functional loss and residual capabilities.

For each of the conditions listed the student will examine patients under the supervision and guidance of members of clinical staff. It may be necessary for the students to receive additional instruction on assessing patients with particular conditions. Within each session each student will examine at least three patients.

4. Hospital Clinics
Attendance at appropriate clinics in local hospitals will enable the student to become aware of the routine problems with which patients present and the role of the prostheteist/orthotist in their management.
### Content

**Lectures**
- Introduction to prosthetics
- Introduction to orthotics
- Role of the prosthetist/orthotist
- The clinic team
- Written communication
- Introduction to reasons for amputation
- Introduction to amputation surgery
- Rehabilitation of the lower limb amputee
- Introduction to library information systems
- Introduction to computer software
- Introduction to psychology of loss/disability
- History and organisational structure of the health services
- Verbal communication
- Skin disorders
- Introduction to x-ray and scanning techniques (therapy)
- Patient handling and safe movement

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient handling and safe movement</td>
<td>45</td>
</tr>
</tbody>
</table>

**Lectures/Clinical Demonstrations**
- Practical demonstration – rehabilitation of the lower limb amputee
- Patient assessment

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient assessment</td>
<td>6</td>
</tr>
</tbody>
</table>

**Hospital Clinics**
- Lower limb prosthetic clinics
- Lower limb orthotic clinics
- Chiropody/foot clinics

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiropody/foot clinics</td>
<td>21</td>
</tr>
</tbody>
</table>

**Total**

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>72</td>
</tr>
</tbody>
</table>

### Mathematics and Statistics

An introduction to a variety of mathematical and statistical concepts which are of use in biologically related disciplines. Simple examples will be employed to show the uses of the mathematical and statistical concepts described. The course will be illustrated throughout by applications in the fields of biology, chemistry and physics.

**Mathematics**

- 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.
Statistics

Organisation of data: population, samples, data collection, measures of location and dispersion, skewness.
Probability: sample space, events, laws of probability, independent events.
Probability models: discrete and continuous random variables, expected values, Binomial, Poisson and Normal models, illustration of situations modelled by these distributions.
Estimation: sampling, distribution of sample proportion and sample mean, confidence limits for population proportion and mean (large and small samples), minimum sample size for given precision.
Regression: product moment correlation coefficient, least squares estimation for linear model.

Total 72

Graphical Communication

An introduction to concepts of communication and the basic elements of technical drawing.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isometric sketching and 3D visualisation</td>
<td></td>
</tr>
<tr>
<td>First and third angle projections</td>
<td></td>
</tr>
<tr>
<td>Auxiliary views and sections</td>
<td></td>
</tr>
<tr>
<td>Use of drawing standards</td>
<td></td>
</tr>
<tr>
<td>Application of machine tolerances</td>
<td></td>
</tr>
<tr>
<td>Simple assembly drawings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
</tr>
</tbody>
</table>

Electrotechnology

An introduction to the principles of electricity applicable to the practice of prosthetics and orthotics. These principles are applied to a programme of laboratory experiments which enable the student to become familiar with current electronic measurement practice.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic concepts</td>
<td></td>
</tr>
<tr>
<td>The SI system of units. Charge, current, potential, potential difference, resistance, electromotive force, energy, power. Circuit symbols.</td>
<td>Lectures 4</td>
</tr>
<tr>
<td>DC Circuits</td>
<td></td>
</tr>
<tr>
<td>Inductance and Capacitance</td>
<td></td>
</tr>
<tr>
<td>The inductor: voltage/current relationship, time response for current and voltage, energy storage, definition of the Henry. The capacitor: current/voltage relationship, time response for voltage and current, energy storage, definition of the Farad.</td>
<td>Lectures 6</td>
</tr>
</tbody>
</table>

Total 72
AC Circuits
The sine wave: frequency, period, phase, peak value, instantaneous value, mean half-cycle value, rms value. Inductive and capacitive reactance, impedance, phase angle. RL, RC and RLC series circuits: complexor diagrams, apparent and active power, power factors. Lectures 6

Transformers
The principle of the transformer. The ideal transformer: voltage, turns and current ratios. The transformer as a matching device. Lectures 3

Power Supplies
The diode: ideal and practical current/voltage characteristics. Half-wave and full-wave rectifier circuits. Waveforms with and without smoothing circuits. Mean output voltage for purely resistive load. Lectures 3

Amplifiers
The amplifier as a system element. Small-signal equivalent circuits: voltage, current and power gains, the decibel, input and output impedances. Frequency response of different types of amplifier. Operational amplifiers: ideal characteristics, parameter values in typical amplifiers. Noise in amplifiers. Lectures 6

Feedback
Series voltage negative feedback. The general feedback equation. Open-loop gain. Effect of negative feedback on input and output impedances, bandwidth, distortion and noise. Operational amplifier circuits. Positive feedback: instability and self-oscillation in amplifiers, oscillators. Lectures 4

Interface Rejection Techniques
Filters, screened leads, differential amplification, avoidance of earth loops, dummy sources (e.g. strain gauges in a bridge layout). Carrier-wave modulation and multiplexing. (The last item refers to implanted transmitters). Use of optical fibres in place of conductors. Lectures 4

Measurements
The cathode-ray oscilloscope. Summary of recording instruments. Concepts of resolution and accuracy applied to digital and analogue instruments. Transducers for temperature, pressure, light, sound; description, specification and use in circuit. Lectures 4

Myoelectrodes
Technology of metal and metal-paste electrodes; the equivalent circuit between electrodes; stability; sources of unwanted voltages in electrode systems. Other types of myoelectrodes: micro-electrodes, implanted electrodes; comparison with surface electrodes. Lectures 2

Safety
Description of single-phase and three-phase supply systems and voltages involved. Function of line, neutral and earth in single-phase systems. Pin connections and colour codes. Effect on safety of fault conditions. Fuses, miniature circuit breakers (MCB) and residual current devices (RCD). Lectures 2

Total Lectures 48
Total Tutorials/Labs. 24

32
FIRST YEAR

Content of practical instruction

<table>
<thead>
<tr>
<th>Topic</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory workshop practice</td>
<td></td>
</tr>
<tr>
<td>Use of machinery and equipment e.g. sewing machines, routers etc. and hand tools.</td>
<td>174</td>
</tr>
</tbody>
</table>

General note to practical instruction, years I, II and III:

The following sections are preceded by theoretical teaching, illustrated by demonstration and followed by closely supervised practical instruction in the manufacture and fitting of prosthetic and orthotic devices to selected patients acting as models for teaching purposes. Each device involves casting, rectification, manufacture and fitting/alignment.

- Trans-tibial prostheses                         120
- Foot and foot-orthoses                          90
- Ankle-foot-orthoses                             60

Total 444
SECOND YEAR

Content of theoretical subjects

Life Sciences II

The course continues from Life Sciences I to examine the structure and functioning of body systems. Emphasis is placed on areas which are of particular relevance to prosthetic and orthotic practice.

Laboratory work includes demonstrations and microscopic work to facilitate understanding of the relationship between structure and function in living systems. Experimental physiology is used to illustrate topics covered in the lecture course.

Detailed anatomy of the upper limb and spine is examined. The practical work will consist of demonstrations.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Anatomy of Upper Limb and Spine:</td>
<td></td>
</tr>
</tbody>
</table>
| survey of structure and function of upper limb; detailed structure and function of bones and joints of upper limb; blood supply to limb; brachial plexus and main nerves to upper limb; cutaneous nerve supply; origins, insertions, actions and nerve supply of musculature of upper limb; surface anatomy. Outline of structure and function of vertebral column; detailed structure of vertebrae throughout vertebral column; structure and function of atlanto-occipital, atlanto-axial and all other intervertebral joints; musculature producing movements of vertebral column. Gross structure of spinal cord; spinal nerves; transverse section of spinal cord and nerve roots at various levels; meninges and cerebrospinal fluid. | Lectures 30 hours  
Tutorials/Laboratories 20 hours |
| Development: | |
| mitosis; cytokinesis; meiosis; gametogenesis; fertilisation; differentiation; embryology; basic theories of genetics with particular reference to inheritance in humans; inheritance of physical abnormalities. | Lectures 21 hours  
Tutorials/Laboratories 14 hours |
| Body Fluids and Defence Mechanisms | |
| body fluid compartments; functions of cellular and plasma components of blood; diversity and behaviour of micro-organisms; opportunistic pathogens and their control; body response to infection and injury, including role of skin, mucous membranes, phagocytes, serum and tissue proteins, inflammatory response; specific immune response; development of abnormal cells. | Lectures 21 hours  
Tutorials/Laboratories 14 hours |

Total Lectures 72 hours  
Total Tutorials/Labs. 48 hours
Mechanics and Biomechanics II

Application of the principles of the Foundation Material course developed in Mechanics and Biomechanics I, to the human body. The students should be capable of calculating the stress levels applied to various prosthetic/orthotic components for given loaded conditions.

Students will apply the concept of static and dynamic equilibrium to analyse joint forces during walking. The walking patterns of normal subjects, amputees and orthotic patients will be analysed and the concept of static equilibrium will be applied to lower limb prostheses and orthoses to calculate patient/device interface forces and pressures.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Concepts 1</strong></td>
<td></td>
</tr>
<tr>
<td>Shear force and bending moment diagrams.</td>
<td></td>
</tr>
<tr>
<td>Centroids, $2^{\text{nd}}$ moment of area and mass, theorem of parallel axes.</td>
<td></td>
</tr>
<tr>
<td>Bending stress, torsional stress of circular shafts, combined axial and bending stresses, combined bending and torsional stresses, combined axial/bending/torsional stresses.</td>
<td></td>
</tr>
<tr>
<td>Open and closed helical springs. Beam deflection.</td>
<td>Lectures 24</td>
</tr>
<tr>
<td>Joint Force Analysis</td>
<td>Lectures 10</td>
</tr>
<tr>
<td>Body segment parameters. Joint force during swing.</td>
<td></td>
</tr>
<tr>
<td>During stance phase, foot/ankle joint forces, knee joint force, hip joint force.</td>
<td></td>
</tr>
<tr>
<td>Human Movement Analysis</td>
<td>Lectures 17</td>
</tr>
<tr>
<td>Normal gait: force plate/TV analysis/electromyography studies, energy studies, gait repeatability, variation due to age, variation due to footwear.</td>
<td></td>
</tr>
<tr>
<td>Amputee gait: force plate/TV analysis emg studies, energy studies, comparison with normal gait, gait variation due to alignment, amputation level, reason for amputation, prosthetic components.</td>
<td></td>
</tr>
<tr>
<td>Orthotic gait: force plate/TV analysis/emg studies, energy studies, comparison with normal gait, gait variation due to pathological condition, orthoses, orthotic components.</td>
<td></td>
</tr>
<tr>
<td>Lower Limb Prosthetics</td>
<td>Lectures 12</td>
</tr>
<tr>
<td>Socket and alignment biomechanics plus gait deviations of the following prostheses: partial foot, Syme, trans-tibial, knee disarticulation, trans-femoral, hip disarticulation/hemi-pelvectomy. Analysis of socket forces, analysis of prosthetic components.</td>
<td></td>
</tr>
<tr>
<td>Lower Limb Orthotics</td>
<td></td>
</tr>
<tr>
<td>General introduction, biomechanical principles, cast rectification, 3 point force system. Analysis of patient/device interface forces and calculation of force magnitudes for orthoses covering the following joints: ankle, knee, hip.</td>
<td>Lectures 12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lectures</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Lectures</td>
<td>45</td>
</tr>
</tbody>
</table>
### Prosthetics and Orthotics Science II
(See general note at Prosthetics and Orthotics Science I)

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle-foot-orthoses</td>
<td>8</td>
</tr>
<tr>
<td>Trans-femoral prostheses</td>
<td>9</td>
</tr>
<tr>
<td>Knee and ankle disarticulation prostheses</td>
<td>10</td>
</tr>
<tr>
<td>Upper limb prostheses</td>
<td>9</td>
</tr>
<tr>
<td>Upper limb orthoses</td>
<td>6</td>
</tr>
<tr>
<td>Spinal orthoses</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>

### Clinical Studies II
(See general note at Clinical Studies I).

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures/Clinical Demonstration</td>
<td></td>
</tr>
<tr>
<td>Hospital Administration</td>
<td></td>
</tr>
<tr>
<td>Prosthetic/Orthotic/Wheelchair supply</td>
<td></td>
</tr>
<tr>
<td>Upper Motor Neurone disorder</td>
<td></td>
</tr>
<tr>
<td>Lower Motor Neurone disorder</td>
<td></td>
</tr>
<tr>
<td>Demyelination disorders</td>
<td></td>
</tr>
<tr>
<td>X-Rays interpretation</td>
<td></td>
</tr>
<tr>
<td>Congenital deformities</td>
<td></td>
</tr>
<tr>
<td>P.V.D.</td>
<td></td>
</tr>
<tr>
<td>Geriatric medicine</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation of upper limb amputees</td>
<td></td>
</tr>
<tr>
<td>Spinal injuries</td>
<td><strong>36</strong></td>
</tr>
<tr>
<td>Patient Contact Sessions</td>
<td></td>
</tr>
<tr>
<td>Amputees (Prosthetics)</td>
<td></td>
</tr>
<tr>
<td>Orthotic patients</td>
<td></td>
</tr>
<tr>
<td>Arthritic patients</td>
<td><strong>12</strong></td>
</tr>
<tr>
<td>Hospital Clinics</td>
<td></td>
</tr>
<tr>
<td>Lower Limb Prosthetic Clinic</td>
<td></td>
</tr>
<tr>
<td>Lower Limb Orthotic Clinic</td>
<td></td>
</tr>
<tr>
<td>Vascular Clinic</td>
<td><strong>12</strong></td>
</tr>
<tr>
<td>Computer Software</td>
<td><strong>6</strong></td>
</tr>
<tr>
<td><em>Private Study/Tutorial</em></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>
**Computer Studies**

Information technology is increasingly being used in the design and manufacture of prosthetic and orthotic devices. Techniques of computer-aided patient measurement and device design and manufacture are emerging from research and development efforts and increasingly being applied in clinical practice. In addition, the Internet is increasingly useful as a source of multimedia information for the profession. The nature and extent of its impact will be of increasing importance.

This course aims to introduce students to these application areas through a series of lectures, demonstrations and practical work.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course will consist of lectures to provide general information followed by approximately twenty hours of demonstration and practical work.</td>
<td></td>
</tr>
<tr>
<td>Techniques of computer-aided patient measurement and device manufacture, which are relevant to prosthetics and orthotics will be examined.</td>
<td></td>
</tr>
<tr>
<td>Commercially available systems for prosthesis socket design will be demonstrated and practical exercises shall be carried out.</td>
<td></td>
</tr>
<tr>
<td>Internet exercises will be carried out on modem multimedia computers.</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>
**SECOND YEAR**

**Content of practical instruction**

*(See general note at FIRST YEAR practical instruction)*

<table>
<thead>
<tr>
<th>Topic</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle-foot-orthoses</td>
<td>114</td>
</tr>
<tr>
<td>Trans-femoral prostheses</td>
<td>108</td>
</tr>
<tr>
<td>Knee and ankle disarticulation prostheses</td>
<td>120</td>
</tr>
<tr>
<td>Upper limb prostheses</td>
<td>120</td>
</tr>
<tr>
<td>Upper limb orthoses</td>
<td>60</td>
</tr>
<tr>
<td>Spinal orthoses</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>582</strong></td>
</tr>
</tbody>
</table>
THIRD YEAR

Content of theoretical subjects

Life Sciences III

The structure and functioning of body systems, which are of particular relevance to prosthetic and orthotic practice, are studied in depth. At the same time, the related pathophysiology and pathology of each system is examined.

Laboratory work includes microscopy, demonstrations, and experimental work to illustrate topics covered in the lecture course.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction to Pathophysiology:</strong></td>
<td></td>
</tr>
<tr>
<td>an outline of the basic mechanisms of disease processes: cellular adaptation and injury, neoplasia, inflammation and repair, infections</td>
<td>Lectures 8 hours</td>
</tr>
<tr>
<td><strong>Pathophysiology of Locomotor System:</strong></td>
<td></td>
</tr>
<tr>
<td>pathophysiology of bones; infection; trauma; disuse effects; growth disturbance. Pathophysiology of joints: arthritis; response to injury and deformity. Pathology of muscles: muscular diseases; response to injury; ischaemia; paralysis.</td>
<td>Lectures 9 hours, Tutorials/Labs. 6 hours</td>
</tr>
<tr>
<td><strong>Cardiovascular and Respiratory Systems:</strong></td>
<td></td>
</tr>
<tr>
<td>structure, function and control of heart and blood vessels; formation, composition and fate of blood; transport functions of blood, including blood gas transport, and exchange with tissues; structure and function of lungs and respiratory adaptations to exercise. Pathophysiology: survey of pathophysiological states affecting heart and lung function and their effects on cardiovascular and respiratory physiology; peripheral vascular disease; abnormalities of blood and their effects.</td>
<td>Lectures 18 hours, Tutorials/Labs. 12 hours</td>
</tr>
<tr>
<td><strong>Skin:</strong></td>
<td></td>
</tr>
<tr>
<td>structure of skin; function of skin: protection, heat regulation, sensation, elasticity.</td>
<td>Lectures 3 hours, Tutorials/Laboratories 2 hours</td>
</tr>
<tr>
<td><strong>Pathophysiology of Skin:</strong></td>
<td></td>
</tr>
<tr>
<td>wound repair, response to irritants, response to pressure, ischaemia.</td>
<td>Lectures 3 hours, Tutorials/Labs. 2 hours</td>
</tr>
<tr>
<td><strong>Nervous System:</strong></td>
<td></td>
</tr>
<tr>
<td>structure and properties of neurons and their processes; resting membrane potential; action potential; conduction of nerve impulse; receptor mechanisms; chemical transmission; review of anatomy and function of brain, spinal cord, sensory nerves, somatic motor nerves and autonomic nerves. Pain: function, receptors, transmission pathways, interpretation of pain.</td>
<td>Lectures 18 hours, Tutorials/Labs. 12 hours</td>
</tr>
<tr>
<td><strong>Pathophysiology of Nervous System:</strong></td>
<td></td>
</tr>
<tr>
<td>malformations; infections; effects of trauma on brain and spinal cord; cerebral vascular disease; tumours of brain and spinal cord; disorders of peripheral nerves; demyelinating diseases; degenerative diseases; metabolic disorders.</td>
<td>Lectures 9 hours, Tutorials/Labs. 6 hours</td>
</tr>
<tr>
<td><strong>Total Lectures</strong></td>
<td>72 hours</td>
</tr>
<tr>
<td><strong>Total Tutorials/Labs.</strong></td>
<td>48 hours</td>
</tr>
</tbody>
</table>
Mechanics and Biomechanics III

The application of the principles of biomechanics to the upper limb and spine. Consideration of the mechanical characteristics of body tissues and the effect of the patient/device interface forces on those tissues. Consideration of the effect of the same patient/device interface forces on devices and the design of the devices.

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tissue Mechanics</strong></td>
<td></td>
</tr>
<tr>
<td>Study of the mechanical characteristics of bone, skin, ligaments, cartilage and muscles. Patient/device interface forces and the effects of prosthetic and orthotic devices on such forces.</td>
<td>Lectures 6</td>
</tr>
<tr>
<td><strong>Spinal Biomechanics</strong></td>
<td></td>
</tr>
<tr>
<td>Cervical orthosis patient/device interface forces; thoracic orthosis buckling; scoliosis patient/device interface forces. Lumbar spine loading during normal activities/effect of orthoses on these loads.</td>
<td>Lectures 7</td>
</tr>
<tr>
<td><strong>Upper Limb Biomechanics</strong></td>
<td></td>
</tr>
<tr>
<td>Grasp patterns, grasp forces, mechanical replacement of hand function, augmentation of deficient hand function, prosthetic socket biomechanics, orthosis biomechanics, application of external power, myoelectric control of external power and usage of devices.</td>
<td>Lectures 7</td>
</tr>
<tr>
<td><strong>Control Systems</strong></td>
<td></td>
</tr>
<tr>
<td>Introduction to control theory. Application in prosthetics/orthotics of functional electrical stimulation, hybrid orthoses, myoelectrics and biofeedback. Computer aided design/computer-aided manufacture.</td>
<td>Lectures 6</td>
</tr>
<tr>
<td><strong>Manufacturing Technology</strong></td>
<td></td>
</tr>
<tr>
<td>Design methods within a commercial company.</td>
<td>Lectures 1.5</td>
</tr>
<tr>
<td><strong>Design Concepts</strong></td>
<td></td>
</tr>
<tr>
<td>Buckling, theories of failure/fatigue/stress concentrations, connections, fluid mechanics and beam deflection.</td>
<td>Lectures 22</td>
</tr>
<tr>
<td><strong>Design Applications</strong></td>
<td></td>
</tr>
<tr>
<td>Design test standards/materials. Design calculations for prosthetic/orthotic devices.</td>
<td>Lectures 22.5</td>
</tr>
<tr>
<td><strong>Total Lectures</strong></td>
<td>72</td>
</tr>
<tr>
<td><strong>Total Tutorials/Labs.</strong></td>
<td>36</td>
</tr>
</tbody>
</table>
### Prosthetics and Orthotics Science III

(See general note at Prosthetics and Orthotics Science I).

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip disarticulation prostheses</td>
<td>6</td>
</tr>
<tr>
<td>Knee-ankle-foot-orthoses</td>
<td>12</td>
</tr>
<tr>
<td>Spinal orthoses</td>
<td>6</td>
</tr>
<tr>
<td>Upper limb prostheses</td>
<td>12</td>
</tr>
<tr>
<td>Revision</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>

### Clinical Studies III

(See general note at Clinical Studies I)

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lectures</strong></td>
<td></td>
</tr>
<tr>
<td>Community care act 1990</td>
<td></td>
</tr>
<tr>
<td>New models in community health and community care</td>
<td></td>
</tr>
<tr>
<td>Information retrieval</td>
<td></td>
</tr>
<tr>
<td>Communication skills</td>
<td></td>
</tr>
<tr>
<td>Role of the social worker in rehabilitation</td>
<td></td>
</tr>
<tr>
<td>Psychology of loss/disability</td>
<td></td>
</tr>
<tr>
<td>Business awareness</td>
<td></td>
</tr>
<tr>
<td>Quality assurance</td>
<td></td>
</tr>
<tr>
<td>First aid</td>
<td>51</td>
</tr>
<tr>
<td><strong>Lectures/Clinical Demonstrations</strong></td>
<td></td>
</tr>
<tr>
<td>Rehabilitation of the bilateral amputee</td>
<td></td>
</tr>
<tr>
<td>Mobility aids</td>
<td>6</td>
</tr>
<tr>
<td><strong>Hospital Clinics</strong></td>
<td></td>
</tr>
<tr>
<td>Prosthetic clinics</td>
<td></td>
</tr>
<tr>
<td>Orthotic clinics</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>
## Materials Technology

<table>
<thead>
<tr>
<th>Content</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>METALS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
<td></td>
</tr>
<tr>
<td>Production and refining of metals</td>
<td></td>
</tr>
<tr>
<td>Crystal structure of metals</td>
<td></td>
</tr>
<tr>
<td>Phase equilibrium diagrams, solid solubility</td>
<td></td>
</tr>
<tr>
<td>Relationship of properties to micro/crystal-structure</td>
<td></td>
</tr>
<tr>
<td><strong>Tailoring Metals for Service</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Alloying</strong></td>
<td></td>
</tr>
<tr>
<td>Effects of work/age hardening. Theory of solid solution hardening, phase transformations, heat treatment, quenching, surface hardening, annealing, normalising, tempering, corrosion and oxidation.</td>
<td></td>
</tr>
<tr>
<td>In depth illustration of the effects of the above when applied to elements e.g. iron-carbon or aluminium alloys with their diagrams, structures and related mechanical properties of steels.</td>
<td></td>
</tr>
<tr>
<td><strong>Fabrication</strong></td>
<td></td>
</tr>
<tr>
<td>Methods and effects on properties e.g. cold/hot working, rolling extrusion, panel beating, spinning and machining.</td>
<td></td>
</tr>
<tr>
<td><strong>Joining Metals</strong></td>
<td>Lectures 25 hours</td>
</tr>
<tr>
<td>Welding, brazing, soldering techniques and their effects on structure and properties.</td>
<td></td>
</tr>
</tbody>
</table>

| **PLASTICS** | |
| **Introduction** | |
| Viscoelastic behaviour | |
| Types of plastics and molecular structures | |
| Composite materials | |
| relationship of properties to structures | |
| **Thermoforming Plastics and their Fabrication Processes** | |
| Monomers, polymers, additives | |
| Microstructures and mechanical properties effect on properties of method of production | |
| Fabrication processes | |
| Effects of fabrication process; microstructural changes, shrinkage and distortion, residual stresses, molecule orientation, effect of overheating and other degradation during processing. | |
| Environmental effects | |
| **Thermosetting Plastics, Composite Materials and Fabrication** | |
| Resins and foams | |
| Reinforcing fibres | |
| Casting tapes and other water setting resins | |
| Lay-ups and mechanical properties | |
| Fabrication processes and their effects on the materials. | |
| **Joining of Plastics** | Lectures 21 hours | Laboratories/Tutorials 13 hours |
| Welding, adhesives and their effect on structure and properties. | |
| **Total Lectures** | 46 hours |
| **Total Laboratories/Tutorials** | 26 hours |
THIRD YEAR

Content of practical instruction

(See general note at FIRST YEAR practical instruction)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Allocated hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip disarticulation prostheses</td>
<td>66</td>
</tr>
<tr>
<td>Knee-ankle-foot-orthoses</td>
<td>162</td>
</tr>
<tr>
<td>Spinal orthoses</td>
<td>60</td>
</tr>
<tr>
<td>Upper limb prostheses</td>
<td>144</td>
</tr>
<tr>
<td>Revision</td>
<td></td>
</tr>
<tr>
<td>Lower limb prostheses</td>
<td>30</td>
</tr>
<tr>
<td>Lower limb orthoses</td>
<td>30</td>
</tr>
<tr>
<td>Spinal orthoses</td>
<td>30</td>
</tr>
<tr>
<td>Upper limb orthoses</td>
<td>30</td>
</tr>
<tr>
<td>Ankle-foot-orthoses</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>582</strong></td>
</tr>
</tbody>
</table>
FOURTH YEAR

Clinical Practice

Course Aims and Teaching Strategies

The object of the clinical practice is to provide the student with experience of clinical management and to produce a prosthetist/orthotist of professional standing who can play a full part in the clinical team. The clinical practice will comprise two six-month placements, one in prosthetics and the other in orthotics and will be carried out in approved centres attached to the hospital service. At each centre a doctor and a prosthetist or orthotist will be designated as the students’ supervisors. The student will be responsible to the prosthetic/orthotic supervisor for the performance of his or her duties during the placement.

The holiday entitlement during each six-month placement is three weeks. This includes statutory holidays.

During each period of clinical practice the student is required to keep a record of clinical activities and a log-book will be supplied for this purpose. The work carried out by the student will be assessed by his or her supervisor and reports will be made of the student’s progress after four weeks, three months and six months. These reports will be discussed with the student and the student will be asked to countersign the report. The supervisor will report on the student’s performance under the following headings:

- Clinical prosthetics/orthotics;
- Technical prosthetics/orthotics;
- Professional development;
- Interpersonal relationships;
- Communication skills;
- Organisation and management

In addition the supervisor will recommend any remedial action required to improve the performance or correct deficiencies in any of the above aspects of the student’s work.

Clinical Essays

As part of the assessment of the clinical placements in the 4th year, each student must submit one essay for each 6 months of the clinical placement.

The bulk of each essay should be the student’s original work based on some aspect of prosthetic/orthotic management relating to the work done during the six months. Typical examples might be:

a) The effect of age on the rehabilitation of the trans-femoral amputee
b) The influence of stump length on the prosthetic fitting of the trans-tibial amputee
c) The orthotic treatment of hemiplegia
d) The orthotic management of idiopathic scoliosis

Students should select a topic for each essay such that the caseload of the clinical placement centre offers sufficient experience to allow the completion of the task.

ALLOCATED HOURS
Prosthetics 805
Orthotics 805