



ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ, ಬೆಂಗಳೂರು

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA, BENGALURU
4th T Block, Jayanagar, Bengaluru – 560 041

RGU/AUTH/128-SYN/187/2017-18

Date: 22.09.2017

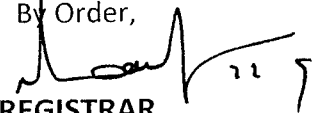
NOTIFICATION

Sub: Revised Ordinance Governing Regulations and Curriculum for Bachelors in Prosthetics and Orthotics 2017-18 onwards.

Ref: 1. Notification No: Authority/BOS-269/2008-09 dated: 03.04.2008.
2. Minutes of the Academic Council meeting held on 30.06.2017.
3. Minutes of the 128th Syndicate meeting held on 23.08.2017
4. Orders of the Hon'ble Vice Chancellor dated: 22.09.2017.

In exercise of powers conferred under section 35(1) of RGUHS Act, 1994, the Syndicate in its meeting held on 23.08.2017 has resolved to implement the Revised Syllabus for Bachelors in Prosthetics and Orthotics which is as per the guidelines of Rehabilitation Council of India (RCI).

This Revised Syllabus will come into force from Academic year 2017-18 onwards.

By Order,

REGISTRAR

To:

1. The Colleges conducting Bachelors in Prosthetics and Orthotics course affiliated to RGUHS.
2. RGUHS web site

Copy to:

1. The Secretary to Governor, Raj Bhavan, Bengaluru 560 001.
2. The Principal Secretary to Medical Education, Dept. of Health & Family Welfare Department, Govt. of Karnataka, Vikasa Soudha, Bengaluru 560 001.
3. The Director, Director of Medical Education, Ananda Rao Circle, Bengaluru-560009
4. PA to Vice- Chancellor, Registrar, Registrar (Eva) and Finance Officer, RGUHS, Bengaluru.
5. Dy. Registrar, Affiliation /Admission / Evaluation Section, RGUHS.
6. Guard File/Office Copy.

Revised.
**Regulations and Curriculum
of
Bachelor in Prosthetics and
Orthotics
2017**



**Rajiv Gandhi University of Health Sciences,
Karnataka
4th 'T' Block, Jayanagar, Bangalore 560 041**

Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore

The Emblem



The Emblem of the Rajiv Gandhi University of Health Sciences is a symbolic expression of the confluence of both Eastern and Western Health Sciences. A central wand with entwined snakes symbolises Greek and Roman Gods of Health called Hermis and Mercury is adapted as symbol of modern medical science. The pot above depicts Amrutha Kalasham of Dhanvanthri the father of all Health Sciences. The wings above it depict Human Soul called Hamsa (Swan) in Indian philosophy. The rising Sun at the top symbolises knowledge and enlightenment. The two twigs of leaves in western philosophy symbolises Olive branches, which is an expression of Peace, Love and Harmony. In Hindu Philosophy it depicts the Vanaspathi (also called as Oushadi) held in the hands of Dhanvanthri, which are the source of all Medicines. The lamp at the bottom depicts human energy (kundalini). The script “Devahitham Yadayahu” inside the lamp is taken from Upanishath Shanthi Manthram (Bhadram Karnebhi Shrunuyanadev...), which says **“May we live the full span of our lives allotted by God in perfect health”** which is the motto of the Rajiv Gandhi University of Health Sciences.

**Rajiv Gandhi University of Health Sciences, Karnataka,
Bangalore**

Vision Statement

The Rajiv Gandhi University of Health Sciences, Karnataka, aims at bringing about a confluence of both Eastern and Western Health Sciences to enable the humankind
“Live the full span of our lives allotted by God in Perfect Health”

It would strive for achievement of academic excellence by Educating and Training Health Professionals who

- Shall recognize health needs of community,
- Carry out professional obligations Ethically and Equitably and in keeping with National Health Policy,

It would promote development of scientific temper and Health Sciences Research.

It would encourage inculcation of Social Accountability amongst students, teachers and institutions.

It would Support Quality Assurance for all its educational programmes

Motto

Right for Rightful Health Sciences Education

*(Schedule annexed to University Notification No. Authority/BOS-269/2008-09 dated
03/04/2008)*

ORDINANCE PERTAINING TO THE REGULATIONS & CURRICULUM OF BACHELOR IN PROSTHETICS AND ORTHOTICS (4 ½ Years)

2017-18

(As per Rehabilitation council of India of 2016)

CONTENT

SECTION	DESCRIPTION	PAGE NO.
	Emblem of RGUHS	2
	Vision Statement of RGUHS	3
	Motto of RGUHS	3
	Notifications	6 -10
I	Aims and Objectives	11- 14
1	Introduction	
2	Aims & Objective	
3	Course Designation	
II	Regulations	15 - 29
4	Eligibility	
5	Selection	
6	Programme pattern	
7	Duration of the programme	
8	Medium of instruction	
9	Working days	
10	Attendance	

11	Adequacy of the syllabus	
12	Course of Study	
13	Clinical facilities	
14	Faculty-students ration	
15	Examination	
16	Criteria for pass	
17	Declaration of class	
18	Carry over	
19	Maximum number of attempts and maximum period for completion of the course	
20	Award of degree	
21	Number of examination	
22	Eligibility of examiner	
23	Certification as a registered professional	
III	Course Description	30 - 114
	BPO 1 st Year	
	BPO 2 nd Year	
	BPO 3 rd Year	
	BPO 4 th Year	
	Internship	
IV	Recommended Books and Journals	115-124
V	Teaching Faculty Norms	125-127
1	Staff Requirement	
2	Qualification & Experience of the Core Faculty	
3	Guest/Part Time Faculty Requirements	
VI	Norms of Infrastructure	128-134
1	Physical facilities	
2	List of tools & equipment required for the BPO training	
VII	Code of Ethics	135



ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ
 13/32, 10ನೇ ಮೈಸೂರು-ಬೆಂಗಳೂರು ರಸ್ತೆ, ಬೆಂಗಳೂರು - 560 041.

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA
 13/32, 10th, Mysuru-Bangalore Road, Bangalore - 560 041. Tel: 080-26961935, 080-26961921 (GPADK)
 Fax: 080-26961921 E-Mail: registrar@rguhs.ac.in

No. Authority/BOS-269/2008-09

03/04/2008

To:

Date:

NOTIFICATION

Sub: Ordinance pertaining to the curriculum of Bachelors in Prosthetics and Orthotics.

Ref: 1) Minutes of BOS Allied Health Sciences Meeting held on 22/02/2008.
 2) Minutes of Syndicate Meeting held on 11/03/2008.

In exercise of the powers conferred under section 35(1) of the RGUHS Act, 1994, the syndicate in its 73rd meeting held on 11.03.2008, is pleased to notify the curriculum pertaining to Bachelor in Prosthetics and Orthotics as shown in the Annexure appended herewith.

The above Ordinance shall come into force with effect from the academic year 2008-09 and onwards.

By Order,

 **REGISTRAR**

To:

All the Principals of colleges conducting Allied Health Sciences courses.

Copy to:

01. The Secretary to Governor, Governor's Secretariat, Raj Bhavan, Bangalore - 560 001.
02. Secretary to Government, Health & Family Welfare Department, (Medical Education), Vikasa Soudha, Bangalore - 560 001.
03. The Director, Department of Medical Education, Anand Rao Circle, Bangalore - 560009.
04. PA to Vice-Chancellor / Registrar / Registrar (Eva.) / Finance Officer.
05. Director, Curriculum Development Cell.
06. Public Information Officer.
07. The Home Page of RGUHS Website.
08. Guard File / Office Copy.



ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ
4ನೇ 'ಟಿ' ಬ್ಲಾಕ್, ಜಯನಗರ, ಬೆಂಗಳೂರು - 560 041.

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA
4th 'T' Block, Jayanagar, Bangalore - 560 041

ACA/BPO-01/2008 - 09

04.07.2008

Ref: _____

NOTIFICATION

Date: _____

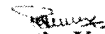
Mobility India, (Dept of Bachelor in Prosthetics and Orthotics), Bangalore.

Sub: Fresh Affiliation for Bachelor in Prosthetics and Orthotics course for the year 2008-09.

- Ref:**
- 1 Application of the college dated: 25.06.2008 for fresh affiliation for Bachelor in Prosthetics and Orthotics course for the year 2008-09.
 - 2 Minutes of the Meeting/s of the Academic Council held on 15.04.2008 & 16.04.2008.
 - 3 Minutes of the Meeting/s of the Syndicate held on 14.05.2008.
 - 4 G.O. No. HFW/254/MPS/2007 Bangalore, dated: 28.06.2008 granting permission for Bachelor in Prosthetics and Orthotics course with an intake of 10 seats from the year 2008-09.

Rajiv Gandhi University of Health Sciences, Karnataka, grants fresh affiliation as per section 45 of RGUHS Act, 1994; for conducting **Bachelor in Prosthetics and Orthotics** Course with an intake of 10 (Ten) seats at **Mobility India, (Dept of Bachelor in Prosthetics and Orthotics), Bangalore.** for the academic year 2008-09. The college should abide by the conditions stipulated by the Government of Karnataka vide its order dated: 28.06.2008.

By Order,


(Dr. Vasantha Kumar.S)
REGISTRAR

To
The Principal,
Mobility India,
(Dept of Bachelor in Prosthetics and Orthotics),
Post Box No 7812, 1st & 1st 'A' Cross,
J P Nagar 2nd Phase,
Bangalore - 560 041.
Copy to:

1. Secretary to Government of Karnataka, Medical Education, Health and Family Welfare, Department, Vikas Soudha, Dr.B.R.Ambedkar Road, Bangalore - 560 001
2. Director of Medical Education, Ananda Rao Circle, Bangalore-560 009
3. Office Copy / Guard File

Phone : +91 (080) - 2696 1933, Telefax : +91 (080) - 2696 1939, E-mail : vhukkeri@rguhs.ac.in, Website : <http://www.rguhs.ac.in>



भारतीय पुनर्वास परिषद्

भारतीय पुनर्वास परिषद्
(सामाजिक न्याय और अधिकारिता मंत्रालय, भारत सरकार के अधीन एक सांविधिक निकाय)
REHABILITATION COUNCIL OF INDIA
(A Statutory Body under the Ministry of Social Justice and Empowerment)
Department of Disability Affairs

EXPED POST

15/014/RCE/

1855

15/01/14
19/01/14

Date: 15/08/14

✓ The Principal/Director
Mobility India,
Post Box No. 7812, 1st & 1st 'A' Cross,
J.P. Nagar, 2nd Phase,
Bangalore, 560078

Sub: Introduction of 6 months internship in Bachelor in Prosthetics and Orthotics, reg.

Madam/Sir,

This is with reference to the representations received from the students/faculties of Bachelor in Prosthetics and Orthotics course on the subject cited above. The Council has examined the matter and the same was placed before the core/expert committee for their opinion.

After detailed deliberation, the Council has decided to introduce six months internship for the students admitted from the academic year 2010-11.

You are therefore requested to implement the same at the earliest under intimation to the Council.

This issues with the approval of competent authority.

Yours faithfully,

(Sunan Kumar)
Deputy Director (Prog.)

CC
To
The Registrar
Rajiv Gandhi University of Health Sciences
4th T Block, Jayanagar, Bangalore,
Karnataka 560041

बी-22, कुतुब इंस्टीट्यूशनल एरिया, नई दिल्ली - 110016
B - 22, Qutab Institutional Area, New Delhi - 110 016
Tel : 011-2653 2408, 2653 2384, 2653 4287, 2653 2816 Fax : 011-2653 4291
E-mail : rehabstd@nde.vsnl.net.in, rehccouncil_delhi@bol.net.in
www.rehabcouncil.nic.in

Please Recycle



ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ ಕರ್ನಾಟಕ

4ನೇ 'ಬಿ' ಬ್ಲಾಕ್, ಜಯನಗರ, ಬೆಂಗಳೂರು - 560 041.

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, KARNATAKA

4th 'T' Block, Jayanagar, Bangalore - 560 041.

Ref: RGU/ACA/AFF/AHS/MI/AHS/2015 16

Date: 16/04/2015

NOTIFICATION

Mobility India, Bangalore.

Sub: Increase in intake for Allied Health Science in Bachelor of Prosthetics & Orthotics course for the year 2014 - 15.

- Ref:**
- 1 Application of the college No MI03-A/BPO_RGUHS/ mc134.12SR. Dated : 13/04/2012, for increase in intake for Bachelor of Prosthetics & Orthotics course for the year 2013-14.
 - 2 Minutes of the Meeting of the Committee Academic Council held on 13/08/2014.
 - 3 Minutes of the Meeting of the Syndicate held on 27/08/2014.
 - 4 G.O. No. **HFV 236 MME. 2014**, Bangalore. Dated: 26/03/2015, granting permission for increase from 10 to 20 seats in **Bachelor of Prosthetics & Orthotics** course from the year 2015 - 16.

Rajiv Gandhi University of Health Sciences, Karnataka grants increase in intake as per section 45 of RGUHS Act 1994; for **Bachelor of Prosthetics & Orthotics** course from 10 to 20 seats at **Mobility India, Bangalore**, for the academic year 2015 -2016.

By Order,
sd/-
Registrar

To,

The Principal / Director / Dean.

Mobility India,

Post Box No 7812, 1st & 1st 'A' Cross,

J.P.Nagar 2nd Phase,

Bangalore - 560 078.

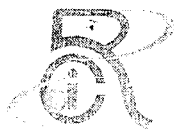
Copy to:

1. Personal Assistant to Vice - Chancellor, RGUHS, Bangalore.
2. The Registrar / Registrar (Evaluation) / Finance Officer RGUHS, Bangalore.
3. Director, CDC / Digital Library / Guard File / RGUHS, Bangalore.
4. All Deputy Registrars, RGUHS, Bangalore.
5. Office Copy.

By Order,
sd/-
Registrar

[Signature]

Phone : (080) -26961928 Telefax : (080)-26961929 Website : <http://www.rguhs.ac.in>



भारतीय पुनर्वास परिषद्

7-128/RCI/2015

भारतीय पुनर्वास परिषद्
(आयुक्तिक न्याय और अधिकारिता मंत्रालय, भारत सरकार के अधीन एक राक्षिक निकाय)
REHABILITATION COUNCIL OF INDIA
(A Statutory Body under the Ministry of Social Justice and Empowerment)
Department of Disability Affairs

ACA/24/15/I

03.07.2015

25/7/2015

25/7/15

To

The Head of RCI approved institutions

Sub: : Maximum duration to complete RCI approved programmes/courses: reg.

Madam / Sir,

The Council has been receiving requests to clarify the maximum duration to complete RCI approved programmes / courses. As per the decision of 69th Executive Committee of the Council, it has been decided that following will be the maximum duration to complete the RCI approved programmes / courses. This will be enforced from the academic year 2015-16 onwards.

Sl. No.	Duration of the RCI approved programme	Maximum duration to complete the programme
1.	1year	2years
2.	2years	3years
3.	3years	4years
4.	4years	6years
5.	4 ½ years	6years
6.	2 ½ years	3years

You are also requested to inform the affiliating university and concerned students in the beginning of the academic session 2015-16.

Yours faithfully,


(S. K. Srivastava)
Member Secretary

बी-22, कुतुब इंस्टीटयूशनल एरिया, नई दिल्ली - 110016

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

Tel.: 011-2653 2408, 2653 2384, 2653 4287, 2653 2816 Fax: 011-2653 4291

E-mail: rehabstd@nde.vsnl.net.in, rehccouncil_delhi@bol.net.in

www.rehabcouncil.nic.in

Please Recycle 

SECTION I

AIM & OBJECTIVE

1. INTRODUCTION

Prosthetics and Orthotics is a specialized health care profession, which combines a unique blend of clinical and technological skills. The Prosthetic and Orthotic professionals assess and evaluate patients, prescribe custom design, fabricate, and fit the orthoses and prostheses. Rehabilitation of persons with locomotor disabilities or neuromuscular disorder is a team work, where centre of attention are the persons with disabilities. This work requires substantial clinical and technical judgment. Prosthetic and Orthotic professional does not only provide service to persons with neuromusculoskeletal disorder and persons with disability, but also it provides service to general health and work related disorder such as foot disorders, fracture, sports injuries, disorders due to aging, tendinitis, muscular pain, aesthetic restoration etc. Prosthetics and Orthotics professionals play an important role in the comprehensive pre and post-surgical management of amputee and other neuromusculoskeletal disorders. Prosthetics and Orthotics professionals makes the patient independent, confident and useful member of the society through comprehensive prosthetic and orthotic management.

2. AIMS AND OBJECTIVES

Professional profile of prosthetics & orthotics graduate or prosthetist/orthotist

The following professional profile has its basis in the Report of the United Nations Inter-Regional Seminar on Standards for the Training of Prosthetist (UN, 1968) the so called Holte Report. It has moreover been modified to comply with Guidelines for Training of Personnel in Developing Countries for Prosthetics & Orthotics Services (WHO, 1990). It was updated at the WHO/ISPO Consultation for Training Personnel in Developing Countries for Prosthetics and Orthotics Services (2003) and finalised in 2005.

At the end of the BPO programme, the student shall be able:

Formulation of treatment

- To assess, prescribe and provide comprehensive prosthetic and orthotic management to the individual and the community appropriate to his/her position as a member of the health care team.
- Be competent to take preventive, supportive, corrective and rehabilitative steps in respect to the commonly encountered problems related to prosthetics and orthotics.

- Appreciate the psycho-social, cultural, economic, and environmental factors affecting health and develop human attitude towards the patients/relatives, in discharging one's professional responsibilities.
- Develop the communication skills to establish effective communication with the patients, their families and stake holders.
- Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal prosthetic and orthotic solution using information from the patient assessment, other members of the health care team, medical charts, etc.
- Communicate and discuss patient goals and expectations and discuss and debate the prosthetic management with the patient, co-workers and other members of the health care team
- Maintain accurate records of patient treatment and follow up as well as confidentiality of such information
- Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the patient at the center.
- Ensure the full inclusion of the patient or customer in the treatment, planning and decision making.

Fitting and fabrication

- Identify, prescribe and justify selection of appropriate materials and componentry in the fabrication of the prostheses or orthoses.
- Reliably measure and capture a positive cast or image of patient / clients' appendage while correctly positioning the body part and if appropriate apply the necessary corrective force system.
- Construct the prostheses or orthoses using appropriate fabrication techniques in preparation for the initial fitting.
- Fit the prostheses or orthoses to the patient using static and dynamic functional criteria established from the original assessment.
- Evaluate the quality of the prostheses or orthoses fit to ensure the appropriate interface contouring, force application and trim lines.

Evaluation and follow-up

- Participate in final check-out and evaluation of fit, function and cosmeses.
- Educate the patient /client and/or caregiver on use, care and function of the prostheses or orthoses.
- Takes part in follow-up procedures as well as maintenance, repairs and replacement of the appliance.
- Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
- Assess and solve prosthetic or orthotic problems as part of short and long term patient care.
- Collaborates and consults with other rehabilitation team

Management and supervision

- Acquire basic management & administrative skills in the areas of materials, financial and human resources related to prosthetics and orthotics.
- Supervise the activity of supporting staff as appropriate.
- Manages Prosthetics and Orthotics 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
- Identifies and introduces improved job methods for increasing efficiency
- 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.

Training and education

- Supervises and conducts the education and training of Prosthetics & Orthotics students.
- Demonstrates to colleagues in his/her profession and other professionals concerned with Prosthetic/Orthotics and also to other interested groups.

- To take part in and contribute to the process of continuing professional development

Community Services

- Makes a professional contribution to and take part in community rehabilitation programmes.
- To make people aware and especially persons with disabilities and the family members, about the need for and benefit of good quality Prosthetics & Orthotics service.

Research and Development

- Develop attitude for self-learning and acquire necessary skills including the use of appropriate technologies.
- Participates in scientific/professional meetings and contributes papers to scientific/professional journals.
- Use outcome measures to review treatment procedures to determine best practice
- To carry out Evidence Based Practice in prosthetics and orthotics.

Legal and Ethical requirement

- Be familiar with the various national policies and acts related to empowerment of Persons with Disabilities.
- Provide patient care which complies with medical/legal requirements.
- Practice within a recognised prosthetics & orthotics code of ethics in patient care, service delivery and research.

3. PROGRAMME DESIGNATION:

BACHELOR IN PROSTHETICS & ORTHOTICS (B.P.O)

SECTION II REGULATIONS

4. ELIGIBILITY

4.1 Qualifying Examination

A candidate seeking admission to the Bachelor of Prosthetics and Orthotics course:

i) Candidate who has passed the two year Pre-University examination conducted by Department of Pre-University Education, Karnataka State or any other examination recognised as equivalent thereto with English as one of the language and physics, chemistry and mathematics/biology as optional subjects with not less than 50% of marks in the aggregate of the relevant science subjects i.e., Physics, Chemistry and Biology/ Mathematics provided the candidate has passed in Physics, Chemistry and Biology/ Mathematics subjects individually to be eligible for admission to this course.

OR

ii) In case of candidates from overseas shall have passed A level conducted by any Boards/Councils/Intermediate Education established by their respective country recognised as equivalent to 10+2 in science by the Rajiv Gandhi University of Health Science/Association of Indian Universities (AIU) with English as one of the subjects and physics, chemistry and mathematics/biology as optional subjects will be eligible for admission to this course.

Note: The case of students belonging to SC/ ST and Category I, the marks obtained in physics, chemistry and mathematics/biology together in qualifying examination is not less than 45% instead of 50% as above for admission to this course.

iii) Candidates who have passed Diploma in Prosthetics & Orthotics approved by Rehabilitation Council of India shall also be eligible for this program and shall be admitted directly to III year BPO course year, provided they have passed 10+2 with Physics, Chemistry, Biology or Mathematics as optional subjects. In-service candidates may be permitted to undergo internship at their parent organization. Admissions will be on the availability of the seats in 3rd year.

4.2 Candidates shall be medically fit.

4.3 A candidate should have attained the age of 17 years on or before 31st December of the year of his/ her admission.

5. SELECTION

Selection shall be based on merit in the qualifying examination.

6. PROGRAMME PATTERN

The programme has been developed on Annual basis.

7. DURATION OF THE PROGRAMME

The duration of the programme is of four and half academic years (inclusive of 6 months of internship), which can be completed in a maximum of **6** years from the date of admission to the programme

8. MEDIUM OF INSTRUCTION

English shall be the medium for the course as well as for the examination.

9. WORKING DAYS

The programme will be conducted for **at least 200 working** days each year exclusive of the period of examination and admission. The institution shall work for a minimum of thirty six hours in a week (five or six days), during which physical presence in the institution of all the teachers and student clinician is necessary to ensure their availability for advice, guidance, dialogue and consultation as and when needed.

10. ATTENDANCE

A candidate is required to attend at least 80% of the total classes conducted in a year in all subjects prescribed for that year, separately, in theory and practical/clinical to become eligible to appear for the university examination in the first attempt.

A candidate pursuing in the course shall study in the institute for the entire period as a full time student. No candidate should join any other regular course of study or appear for any other examination conducted by this university or any other university in India or abroad during the study of Bachelor in Prosthetics and Orthotics Course. Each academic year shall be taken as a unit for calculating the attendance.

100% attendance in internship is compulsory.

11. ADEQUACY OF THE SYLLABUS

The syllabus prescribed for the B.P.O. is on the basis of minimum requirements and therefore, Universities and Institutes implementing the BPO programme can exercise flexibility in opting the number of papers without compromising on the adequacy and validity of the contents prescribed by the RCI.

12. COURSE OF STUDY

The course shall be pursued on full time basis. Details of subject and distribution of hours of teaching in theory and practical from first to fourth year are given in table 1 to 4.

12.1 Subjects and Hours of Teaching:

12.1.1 First Year:

Table 1

Code no.	Subjects	Theory Hours	Practical Hours (Clinical)	Total Hours
BPO/101	Anatomy	100	40	140
BPO/102	Physiology	80	30	110
BPO/103	Workshop Technology and Material Science	80	20	100
BPO/104	Applied Mechanics & Strength of Materials	80	20	100
BPO/105	Biomechanics - I	60	-	60
BPO/106	Basic Electronics	60	-	60
BPO/107/151	Prosthetics - I	80	220	300
BPO/108/152	Orthotics - I	80	220	300
	Subsidiary Subjects			
	Constitution of India	20	-	20
	Kannada	30		30
Total hours		670	550	1220

12.1.2 Second Year**Table 2**

Code no.	Subjects	Theory Hours	Practical Hours (Clinical)	Total Hours
BPO/201	Pathology	80	-	80
BPO/202	Orthopaedics, Amputation Surgery & Imaging Science	80	20	100
BPO/203	Community Rehabilitation & Disability Prevention	60	-	60
BPO/204	Biomechanics - II	60	30	90
BPO/205	Psychology & Sociology	60	-	60
BPO/206/251	Prosthetics Science - II	80	290	370
BPO/207/252	Orthotics Science - II	80	290	370
BPO/208	Pharmacology	60	-	60
	Subsidiary Subjects			
	Personal & Professional Studies	30	-	30
	Total hours	590	630	1220

12.1.3 Third Year**Table 3**

Code no.	Subjects	Theory Hours	Practical Hours (Clinical)	Total Hours
BPO/301/353	Computer Science & graphical communication	60	90	150
BPO/302	Biomechanics - III	60	-	60
BPO/303	Assistive Technology	70	80	150
BPO/304	Research Methodology & Biostatistics	60	-	60
BPO/305/351	Prosthetics Science - III	80	320	400
BPO/306/352	Orthotics Science - III	80	320	400
Total hours		410	810	1220

12.1.4 Fourth Year**Table 4**

Code no.	Subjects	Theory Hours	Practical Hours (Clinical)	Total Hours
BPO/401/451	Prosthetics Science-IV	60	160	220
BPO/402/452	Orthotic Science-IV	80	160	240
BPO/403	Management & Administration	80	-	80
BPO/453	Prosthetics Clinical Practice	-	250	250
BPO/454	Orthotics Clinical Practice	-	250	250
BPO/455	Project Work		180	180
Total hours		220	1000	1220

13. CLINICAL FACILITIES

Facilities required for diagnostic evaluation of locomotor impairment and associated disorders, both functional and organically based clients of all age groups with locomotor impairment.

Load and variety of patients/ clients should be commensurate with number of courses conducted and also to meet the clinical practicum requirement of each year of the course.

14. FACULTY-STUDENT RATIO

The faculty-student ratio in the area of B.P.O may be as per the RCI norms.

15. EXAMINATION

15.1. Internal Assessment (IA):

Regular periodic assessment shall be conducted throughout the course. There should be a minimum of two (2) periodical test during I, II, III and final year in theory and Practical in each subject/paper separately. The average of the test marks will be calculated and reduced to 20 in theory and 20 in practical. The marks of the internal assessment shall be sent to the university.

A candidate shall secure not less than 50% of marks prescribed for internal assessment in theory and not less than 50% marks prescribed in practical, separately, in each subject/paper to be eligible to appear in the university examination. Internal assessment marks are added to the final marks awarded by the University.

15.2. Schedule of examination:

The university shall conduct two examinations annually at an interval of not less than 4 to 6 months as notified by the university from time to time. A candidate who satisfies the requirement of attendance & progress in internal assessment as stipulated by the university shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the Principal/ Head of the institution along with the application for examination and the prescribed fee.

- There will be University examination every year that means at the end of 1st, 2nd, 3rd and final year.
- The Examination shall be conducted by means of theory, Practical & Viva.
- The divisions after the University examination results will be awarded as per university norms.
- A detailed discussion on the project work shall be conducted after the fourth year theory examinations and during practical examination, by a panel of two university appointed examiners, of whom one will be internal and the other external examiner.
- **Subsidiary subject examination:** The examination for the Subsidiary subject shall be conducted by the respective college. The pass criterion is 35% of the maximum marks of the paper. The marks obtained by the students shall be sent to the Registrar RGUHS prior to the dates notified for the examinations.

15.3. Scheme of examination:

The particulars of subjects for examination and distribution of marks are shown in the Table -1 to Table - 4.

15.3.1 First year

Table 1

Code no.	Subject	University Examination							Grand Total
		Theory				Practical			
		Theory	IA	Viva	Sub Total	Practical	IA	Sub Total	
BPO/101	Anatomy	80	20	-	100	No practical			100
BPO/102	Physiology	80	20	-	100	No practical			100
BPO/103	Workshop Technology and Material Science	80	20	-	100	No practical			100
BPO/104	Applied Mechanics & Strength of Materials	80	20	-	100	No practical			100
BPO/105	Biomechanics - I	80	20	-	100	No practical			100
BPO/106	Basic Electronics	80	20	-	100	No practical			100
BPO/107/151	*Prosthetics – I	80	20	50	150	80	20	100	250
BPO/108/152	*Orthotics - I	80	20	50	150	80	20	100	250
Total marks					900			200	1100

15.3.2. Second year**Table2**

Code no.	Subject	University Examination							Grand Total
		Theory				Practical			
		Theory	IA	Viva	Sub Total	Practical	IA	Sub Total	
BPO/201	Pathology	80	20	-	100	No practical			100
BPO/202	Orthopaedics, Amputation Surgery & Imaging Science	80	20	-	100	No practical			100
BPO/203	Community Rehabilitation & Disability Prevention	80	20	-	100	No practical			100
BPO/204	Biomechanics - II	80	20	-	100	No practical			100
BPO/205	Psychology & Sociology	80	20	-	100	No practical			100
BPO/206 /251	*Prosthetics Science - II	80	20	50	150	80	20	100	250
BPO/207 /252	*Orthotics Science - II	80	20	50	150	80	20	100	250
BPO/208	Pharmacology	80	20	-	100	No Practical			100
Total marks					900			200	1100

15.3.3. Third year**Table 3**

Code no.	Subject	University Examination							Grand Total
		Theory				Practical			
		Theory	IA	Viva	Sub Total	Practical	IA	Sub Total	
BPO/301/353	*Computer Science & graphical communication	80	20	-	100	80	20	100	200
BPO/302	Biomechanics - III	80	20	-	100	No Practical			100
BPO/303	Assistive Technology	80	20	-	100	80	20	100	200
BPO/304	Research Methodology & Biostatistics	80	20	-	100	No Practical			100
BPO/305/351	*Prosthetics Science - III	80	20	50	150	80	20	100	250
BPO/306/352	*Orthotics Science - III	80	20	50	150	80	20	100	250
Total marks					700			400	1100

15.3.4. Fourth year**Table 4**

Code no.	Subject	University Examination							Grand Total
		Theory				Practical			
		Theory	IA	Viva	Sub Total	Practical	IA	Sub Total	
BPO/401/451	*Prosthetics Science-IV	80	20	50	150	80	20	100	250
BPO/402/452	*Orthotic Science-IV	80	20	50	150	80	20	100	250
BPO/403	Management & Administration	80	20	-	100	No Practical			100
BPO/404/453	*Prosthetics Clinical Practice	No Theory				180	20	200	200
BPO/405/454	*Orthotics Clinical Practice	No Theory				180	20	200	200
BPO/406	Project Work**	No Theory				200	-	200	200
	Total Marks				400			800	1200

*All practical examinations must be held in the respective clinical areas. One internal and one external examiner should jointly conduct practical/ clinical examination for each student.

** Joint project may also be undertaken. A detailed discussion on the project work shall be conducted after the third year of theory examinations and during practical examination, by a panel of two university appointed examiners, of who one will be internal and the other external examiner.

15.4. Distribution of type of question and marks for various subjects:

THEORY

SUBJECTS HAVING MAXIMUM MARKS = 100		
TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS FOR EACH QUESTION
ESSAY TYPE	3 (2X10)	10
SHORT ESSAY TYPE	12 (10X5)	5
SHORT ANSWER TYPE	12 (10X3)	3

SUBJECTS HAVING MAXIMUM MARKS = 80		
TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS FOR EACH QUESTION
ESSAY TYPE	3 (2X10)	10
SHORT ESSAY TYPE	8 (6X5)	5
SHORT ANSWER TYPE	12 (10X3)	3

SUBJECTS HAVING MAXIMUM MARKS = 50		
TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS FOR EACH QUESTION
ESSAY TYPE	3 (2X10)	10
SHORT ESSAY TYPE	5 (3X5)	5
SHORT ANSWER TYPE	7 (5X3)	3

16. CRITERIA FOR PASS

A candidate has to fulfil the following criteria:

For declaration of pass in any subject in the University examination, a candidate shall pass both in Theory and Practical/Clinical examinations components separately as stipulated below:

- The Theory component consists of marks obtained in University Written paper(s), internal assessment and viva voce. For a pass in theory, a candidate shall secure not less than 50% marks in aggregate i.e., marks obtained in written examination, Internal Assessment and Viva Voce added together. For a pass in practical/clinical examination, a candidate shall secure not less than 50% marks in university practical examination and internal assessment in aggregate.

- A candidate not securing 50% marks in aggregate in Theory or Practical/Clinical examination in a subject shall be declared to have failed in that subject and is required to appear for both Theory and Practical/Clinical again in the subsequent examination in that subject.

17. DECLARATION OF CLASS:

- A candidate having appeared in all the subjects in the same examination and passed that examination in the first attempt will be put into following categories:
 - (i) passed with distinction : 75% and above
 - (ii) passed with First division : 65% and above
 - (iii) Passed with second division : 50% and above
- A candidate passing a university examination in more than one attempt shall be placed in Pass class irrespective of the percentage of marks secured by him/her in the examination.

18. CARRY OVER

- A candidate failing in more than three subjects will not be promoted to the next year.
- Candidate shall not be admitted to the subsequent higher examination unless the candidate has passed in all the papers in the previous examination. **(This clause is modified as per the notification no. AUTH/99-SYN/BPO/AMND/220/2012-13 dated 23/06/2012 of RGUHS as below)**
- Candidate admission to the subsequent higher examination:
 - a. Candidates are permitted to 2nd year BPO examination concurrently along with failed subjects of 1st year BPO. However, these candidates have to pass all the failed subjects of 1st year BPO to become eligible to proceed to 3rd year BPO
 - b. Candidates are permitted to 3rd year BPO examination concurrently along with failed subjects of 2nd year BPO. However, these candidates have to pass all the failed subjects of 2nd year BPO to become eligible to proceed to 4th year BPO
 - c. Candidates are permitted to 4th year BPO examination concurrently along with failed subjects of 3rd year BPO. However, they have to pass all the subjects of 3rd year BPO before the announcement of 4th year BPO result.

- If a candidate fails in theory or practical exam in a paper, in that paper he/she has to re-appear for both in Theory and Practical examination.

19. Maximum number of attempts and maximum period for completion of the course

- Maximum number of attempts permitted for each paper is three including first attempt. Failing which, the candidate will be discharged. **(This clause is deleted as per the RGUHS notification AUTH/BPO/AMND/279/2012-13 on 20/2/2013)**
- The maximum period to complete the course successfully should not exceed **six** years.
- There will be University examinations at specific intervals to cover curriculum of the course as per university norms Minimum passing marks for every subject will be 50% both in theory and practical. The grace marks and divisions will be awarded as per university norms.
- Candidates who fulfill minimum passing mark as mentioned above will be automatically promoted to the higher class, or as per the rule of the university. However, candidates who fail in not more than three subjects in any session will be allowed to keep term in the subsequent class provided, they pass in the supplementary examinations, which will be conducted as per university norms.

20. AWARD OF DEGREE

After successful completion of all examinations, candidate will be awarded with the **"Degree of Bachelor in Prosthetics and Orthotics (BPO)"**. The said degree will be classified by its class such as "First Division, Second Division' or 'Pass' according to the University norms.

21. NUMBER OF EXAMINERS

One internal and one external examiner should jointly conduct practical / clinical examination for each student.

22. ELIGIBILITY OF EXAMINER

All theory & practical examinations in the discipline of Prosthetics and Orthotics shall be conducted only by the regular appointed Prosthetic and Orthotic Faculty / Teachers from a teaching institution.

In case of unavailability of Prosthetic and Orthotic Faculty / Teachers from a teaching institution, one who have passed Master in Prosthetics & Orthotics or Bachelor in Prosthetics and Orthotics with minimum 05 year experience in teaching in a recognized Institution will be eligible to be an examiner.

23. CERTIFICATION AS A REGISTERED PROFESSIONAL

It is mandatory as per Section 13 of RCI Act for every Prosthetist and Orthotist to obtain a "Registered Professional Certificate" from the Rehabilitation Council of India to work in the field of Prosthetics and Orthotics in India. As continuous professional growth is necessary for the renewal of the certificate, the faculty as well as Prosthetist and Orthotist should undergo in-service programme periodically to update their professional knowledge. Amendments, if any, to the regulations of the course will be made periodically by the Rehabilitation Council of India. Any deviation from the above regulations should have the prior approval of the Rehabilitation Council of India.

The successful students will be registered as Prosthetist and Orthotist (Professional). The training institution/organization should take appropriate action to ensure that all passed out students are registered with the Council.

SECTION III

COURSE DESCRIPTION

FIRST YEAR

BPO/101 ANATOMY

Time : 100 hours of theory
: 40 hours of practical

Course Description:

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.

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

- 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 (Student should know origin, insertion, nerve connection and blood supply of each muscle).
- Describe and relate the structure and function of the upper and lower limbs to clinical pathologies.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 9	▶ Describe the microscopic structure of cells and tissues. ▶ Observation of respective slides related to histology.	Histology: General Histology, study of the basic tissues of the body; Microscope, Cell, Epithelium, Connective Tissue, Cartilage, Bone, Muscular tissue, Nerve Teaching learning Method • Lecture discussion • AV aids • Group discussion/activity • Anatomy Lab with microscope
2	T- 6	▶ Describe the	Embryology:

		development of bones and muscles.	Development of bones, axial and appendicular skeleton and muscles Teaching learning Method • Lecture discussion • AV aids • Group discussion • Presentation
		Regional anatomy Thorax:	
3	T- 6	▶ Describe the structure and functions of Heart.	Cardio – Vascular System: ▪ Mediastinum: Divisions and contents ▪ Pericardium: Thoracic Wall: position, shape and parts of the heart; conducting System; blood Supply and nerve supply of the heart. Teaching learning Method • Lecture discussion • AV aids • Group discussion • Project work
4	T-6	▶ Describe the structure and functions of respiratory System ▶ Explain about how diaphragm works during respiration ▶ List the respiratory muscles with origin, insertion, nerve supply and action	Respiratory system ▪ Outline of respiratory passages ▪ Pleura and lungs: position, parts, relations, blood supply and nerve supply ▪ Diaphragm: Origin, insertion, nerve supply and action, openings in the diaphragm. ▪ Intercostal muscles and Accessory muscles of respiration: Origin, insertion, nerve supply and action. Teaching learning Method • Lecture discussion • AV aids • Group discussion • Assignment / Presentation
5	T-6	▶ Describe the structure and functions of peritoneum. ▶ Explain the anatomic features of stomach, intestines, kidney, and urinary bladder and its functions	Abdomen: ▪ Peritoneum: Parietal peritoneum, visceral peritoneum, functions of peritoneum. ▪ Location, size, shape, features, blood supply, nerve supply and functions of the following: stomach, kidney, urinary bladder, intestines.

			Teaching learning Method • Lecture discussion • AV aids • Group discussion • Assignment / Presentation
6	T- 9	▶ Demonstrate anatomical position and its importance ▶ Tell the anatomical terminologies for body parts, body position, locations and direction of body movements ▶ Describe the structure, functions and types of bones and joints	Musculo-Skeletal Anatomy ▪ Anatomical positions of body, axes, planes, common anatomical terminologies ▪ Connective tissue classification ▪ Bones- Composition & functions, classification and types according to morphology and development ▪ Joints- Definition, classification, structure of fibrous, cartilaginous joints, blood supply and nerve supply of joints Teaching learning Method • Lecture discussion • AV aids • Group discussion/activity
7	T- 18 P- 10	▶ Describe the bones, joints, muscles and its soft parts, blood supply and motor and cutaneous nerve supply of upper limb ▶ Demonstrate the surface markings of the upper limb bones	Upper Extremity : a) Osteology: Clavicles, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges. b) Soft parts: pectoral region, axilla, cubital fossa, palm, dorsum of hand, muscles, nerves, blood vessels. c) Joints: Shoulder girdle, shoulder joint, elbow joints, radio ulnar joint, wrist joint and joints of the hand. d) Arches of hand, skin of the palm and dorsum of hand. Sensory distribution in the palm and dorsum of hand. Teaching learning Method • Lecture discussion • AV aids • Group discussion/activity • Assignment / Presentation

8	T- 25 P- 10	▶ Explain the bones, joints, muscles, soft parts, blood supply, motor and cutaneous nerve supply of lower limb ▶ Demonstrate the surface marking of the lower limb bone	Lower Extremity: a) Osteology: Hip bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges. b) Soft parts: Gluteal region, front and back of the thigh (Femoral triangle, femoral canal and inguinal canal), medial side of the thigh (Adductor canal), lateral side of the thigh, popliteal fossa, anterior and posterior compartment of leg, sole of the foot, lymphatic drainage of lower limb, venous drainage of the lower limb, arterial supply of the lower limb, arches of foot, skin of foot. c) Joints: Hip Joint, Knee joint, Ankle joint, joints of the foot. Teaching learning Method • Lecture discussion • AV aids • Class /group discussion • Assignment / Presentation
9	T- 9	▶ Describe the bones, joints, muscles of trunk and pelvis	Trunk & Pelvis: a) Osteology: Cervical, thoracic, lumbar, sacral and coccygeal vertebrae and ribs b) Soft tissue-Muscles: Pre and Para vertebral muscles, intercostal muscles, anterior abdominal wall muscles, Inter-vertebral disc. c) Pelvic girdle and muscles of the pelvic floor Teaching learning Method • Lecture discussion • AV aids • Class /group discussion • Assignment / Presentation
10	T- 3	▶ List the bones of face and head.	Head and Neck: Osteology: Mandible and bones of the skull Bones of the face & skull

			Teaching learning Method • Lecture discussion • AV aids • Class /group discussion • Assignment / Presentation
11	T- 3	▶ Demonstrate the surface anatomy of upper and lower limbs, , normal gait and movements in lower limb, upper limb, trunk and pelvis ▶ Demonstrate anthropometric measurements.	Applied Anatomy: Surface anatomy, locomotion and movements. Anthropometry Teaching learning Method • Lecture discussion • Practical demonstration • Group Activity
12	P-20	▶ Observation of various tissues and cells through dissection and demonstration of Lower limbs, upper limbs, spine, surface anatomy and marking. ▶ Familiarize with human surface anatomy and its importance in different stages of fabrication of P&O devices.	Anatomy Practical: Demonstration of various tissues and cells and Dissection - Demonstration of Lower limbs, upper limbs, spine, surface anatomy and marking. Teaching learning Method • Slides • Cadaver • Skeleton • Models

BPO/102 PHYSIOLOGY

Time : 80 hours of theory
: 30 hours of practical

Course Description:

The course is designed to assess the students to acquire the knowledge of the normal physiology of human body and understand the alteration in the physiology for the fabrication of the prosthesis and orthosis.

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

- 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 5	► Describe the structure & functions of the cells, Body water and Body Fluid.	General Physiology ▪ Cell, Organelles, their structure and functions ▪ Transport Mechanisms across the cell membrane ▪ Body fluids: Distribution, composition. Teaching learning Method • Lecture discussion • Group discussion • AV aids
2	T- 9	► Explain about the structure, types, function of blood.	Blood ▪ Introduction: Composition and functions of blood. ▪ Plasma: Composition, functions, Plasma proteins. ▪ RBC: count and its variations, Haemoglobin – Anemia, Blood indices, PCV, ESR. ▪ WBC: Classification, functions, count, its variation of each. Immunity ▪ Platelets:, functions, count, its variations ▪ Blood coagulation. (brief) ▪ Lymph: Composition, and functions. Teaching learning Method

			• Lecture discussion • Group discussion • AV aids
3	T- 9	► Explain the types of the nerve muscles & Functions.	Nerve Muscle Physiology ▪ Introduction: Resting membrane potential. Action potential ▪ Nerve: Structure and functions of neurons. Properties and impulse transmission of nerve fibres. ▪ Neuroglia: Types and functions. ▪ Muscle: Classification. Skeletal muscle: Structure, Neuromuscular junction, Motor Unit. ▪ Fatigue. Teaching learning Method • Lecture discussion • Group discussion • AV aids
4	T- 9	► Explain about the structure and function of heart.	Cardiovascular System ▪ Introduction: Physiological anatomy and nerve supply of the heart and blood vessels. ▪ Conducting system: Components. Impulse conduction. Cardiac Cycle: Definition. Phases of cardiac cycle. Pressure and volume curves. ECG: Definition. ▪ Cardiac Output: Definition. ▪ Functional anatomy of vascular and lymphatic system ▪ Arterial Blood Pressure: Definition. Normal values and its variations ▪ Hypertension Teaching learning Method • Lecture discussion • Group discussion • AV aids
5	T- 9	► Explain about the structure and of respiratory system. ► Understand the mechanism of breathing.	Respiratory System ▪ Introduction: Physiological anatomy – Pleura, tracheo-bronchial tree, alveolus, respiratory membrane and their nerve supply. Functions of respiratory system. Respiratory muscles. ▪ Mechanics of breathing: – Inspiration; Expiration; Intrapleural pressure, Recoil tendency and lung volumes ▪ Hypoxia ▪ Disorders of Respiration: Dyspnoea.

			Orthopnoea. Hyperpnoea, hyperventilation, apnoea, tachypnoea Teaching learning Method • Lecture discussion • Group discussion • AV aids
6	T- 23	► Explain about the structure & function of nervous system	Nervous System ▪ Introduction: Organization of CNS – central and peripheral nervous system. Functions of nervous system. ▪ Synapse: Functional anatomy, classification, Synaptic transmission. ▪ Sensory Mechanism: Sensory receptors, function, classification and properties. ▪ Sensory pathway: The ascending tracts – Posterior column tracts, lateral spinothalamic tract and the anterior spinothalamic tract – their origin, course, termination and functions. ▪ Pain sensation: mechanism of pain, Cutaneous pain –slow and fast pain, hyperalgesia. Deep pain, visceral pain – referred pain. ▪ Sensory cortex. Somatic sensations: crude touch, fine touch, tactile localization, tactile discrimination, stereognosis, vibration sense, kinesthetic sensations ▪ Motor Mechanism: Motor Cortex. Motor pathway: The descending tracts – pyramidal tracts, extra pyramidal tracts – origin, course, termination and functions. ▪ Reflex Action: Monosynaptic and polysynaptic reflexes, superficial reflexes, deep reflexes. Muscle tone –definition, and properties hypotonia, atonia and hypertonia. UMNL and LMNL ▪ Spinal cord Lesions: Complete transection and Hemisection of the spinal cord. ▪ Cerebellum: Functions ▪ Posture and Equilibrium: ▪ Thalamus and Hypothalamus: Nuclei. Functions. ▪ Basal Ganglia: Structures, functions. ▪ Cerebral Cortex: Lobes. Brodmann's areas and their functions. Higher functions of cerebral cortex – learning, memory and speech.

			Teaching learning Method • Lecture discussion • Group discussion • AV aids
7	T- 5	► Explain about the structure, function, abnormalities of kidney.	Kidney and micturition ▪ Introduction and functional anatomy of kidney, innervation, renal circulation and care of any appliances fitting for dysfunction. ▪ Micturition – Physiological anatomy and nervous connection of the bladder, cystometrogram micturition reflex. Teaching learning Method • Lecture discussion • Group discussion • AV aids
8	T- 3	► Explain about the structure, function of the skin.	Integumentary system: Structure of skin, function of skin: Protection, heat regulation, sensation and elasticity. Teaching learning Method • Lecture discussion • Group discussion • AV aids
9	T- 5	► Explain about the structure, function, metabolic disorder of endocrine.	Endocrinology Endocrine Pancreas: Secretory cells, action, regulation of secretion of insulin and glucagon. Glucose metabolism and its regulation. Disorder: Diabetes mellitus Teaching learning Method • Lecture discussion • Group discussion • AV aids
10	T- 3	► Describe about nutrition & metabolism. ► Describe the factors influencing energy expenditure.	Nutrition & Metabolism ▪ An Introduction to Nutrition and Metabolism ▪ Factors influencing energy expenditure Teaching learning Method • Lecture discussion • Group discussion • AV aids
11	P- 30	► To perform an evaluation of human nervous system to recognize	Practical: 1. Clinical examination of nervous system. 2. Clinical examination of sensory system. 3. To study the phenomenon of fatigue in

		normal and abnormal nervous response. ▶ To perform an evaluation of human sensory system to recognize normal and abnormal sensation. ▶ To measure the fatigue in human body.	human by Dynamometer
--	--	--	----------------------

BPO/103 WORKSHOP TECHNOLOGY & MATERIAL SCIENCE

Time : 80 hours of theory
: 20 hours of practical

Course Description:

Students would have competence in practicing effectively and safely within a workshop environment.

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

- 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 Prostheses & Orthoses.
- 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 behaviour 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.

WORKSHOP TECHNOLOGY:

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-30	▶ Able to describe different types of tools, equipment's, machines, attachments and its uses in fabrication of prostheses & orthoses. ▶ Able to use appropriate tools, machine and equipment for specific task. ▶ Follow safety inside the workshop. ▶ Understand and perform fundamental of riveting, soldering, brazing and welding.	General: Introduction to bench work, hand tools, measuring tools and instruments. Equipment for mass production, introduction to lathe machine and its operation, milling machine and its operations, tooling, attachment, Shaping machine and its uses. Grinding machine, Drilling Machine, Abrasive machine etc. Special tools and equipment used in fabrication of orthoses and prostheses. Compressors, Vacuum Pumps and Dust Collection Equipment's, Cutting Tools (Chisels, Saws and Metal Cutters) Pneumatic Tools, Power Cutting tools Workshop Safety & Hazards and Care Mechanical working of metals such as steel and aluminum. Fundamental of riveting, soldering, brazing and welding. Teaching learning Method • Lecture discussion • Sample
2	P-20	▶ To get practical skills on different steps needed for the fabrication of Orthoses and prostheses devices.	Workshop Technology Practical Practice: Practical work on workshop practices. Practical training on lathes, Drilling Machine (Bench and Pedestal), Grinding Machine, Router, hot air oven, sanding machine, heat gun, pneumatic machines and other machines. Practical work on various materials and tools and its use in prosthetics & Orthotics. Teaching learning Method • Lecture discussion • Sample

MATERIAL SCIENCE:

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
3	T-12	▶ To describe about metals and its properties. ▶ To describe the different testing used for metal and its alloy. ▶ To describe about powder metallurgy.	Metal & Alloys: Fundamentals of metals and alloys both ferrous and nonferrous. Properties, testing and inspection of metals and alloys, heat treatment of metals. Powder metallurgy, surface coating of metals. Teaching learning Method • Lecture discussion • Sample
4	T- 5	▶ To describe about wood, its types and its utilization. ▶ Demonstrate wood work and its working tools. ▶ To make pattern for different kinds of jobs	Wood: Wood, types, seasoning, preservation, lamination properties and adhesives for wood. Wood work: Introduction to wood, wood work and wood working tools. Pattern making and making of various kinds of joints. Teaching learning Method • Lecture discussion • Sample
5	T-3	▶ To describe leather, procedure, types and its properties.	Leather: Leather, types, tanning, preservation, lamination, properties and adhesives for leather. Teaching learning Method • Lecture discussion • Sample
6	T-3	▶ Able to describe fabric types and its properties. ▶ Able to maintain the quality of fabrics.	Fabric: Fabric types, properties, utilization, selection and quality control. Teaching learning Method • Lecture discussion • Sample
7	T- 12	▶ Able to describe plastics and its types. ▶ Able to describe its structures and properties.	Polymers & composite materials: Introduction to Plastics, type of plastics and molecular structures. Relationship of properties to structures. Monomers, Polymers, additives, Mechanical properties, effect on properties of method of production. Teaching learning Method

			• Lecture discussion • Sample
8	T-10	▶ Able to describe fabrication process of different plastics and its environmental effect. ▶ Able to perform various techniques of moulding & lamination. ▶ Able to describe the properties of different types of plastic.	Fabrication Processes: Fabrication processes, Effects of fabrication, process, micro structural changes, shrinkage and other degradation during processing, environmental effects. Thermoforming plastics, their fabrication process, thermosetting plastics and fabrication process. Composite materials and their uses-Resin: Acrylic and Polyester. Elastomers, H.D.P.E. PP, PP-CP, Viscoelastic behaviour of plastics. Introduction to fiber reinforced plastics. Introduction to and their processing especially various techniques of moulding and lamination. Joining of plastics, welding, adhesives and their effect on structure and plastics properties. Teaching learning Method • Lecture discussion • Sample
9	T-2	▶ Able to describe types of foams and its uses in P&O	Foams: Different types of foams used in P&O especially Latex, Polyurethane, polyethylene and other kind of rigid/semi rigid/ flexible foams. Teaching learning Method • Lecture discussion • Sample
10	T - 3	▶ Able to describe POP & Silicon, its properties and its uses in P&O.	Plaster of Paris & Silicon and its application procedure in Prosthetic & Orthotic techniques Teaching learning Method • Lecture discussion • Sample

BPO/104 APPLIED MECHANICS & STRENGTH OF MATERIALS

Time : 80 hours of theory
: 20 hours of practical

Course Description:

The Course is designed to assist the students to acquire knowledge of general mechanics, applied mechanics & strength of materials for the fabrication of Orthosis and prosthesis.

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

- 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 20	▶ Able to describe basics and fundamental of mechanics. ▶ Accustomed of all the terminology listed. ▶ Able to solve the numerical related to mechanics.	General Mechanics: Definition of Mechanics, Foundation material on Units, dimensional homogeneity, scalar and vector quantities, Co-ordinate systems, Newton's laws. Resolution and summation of forces and moments in two and three Dimensions, equivalent force systems, free body diagrams, equations of Equilibrium, plans and space frame analysis. Parallel and non- parallel Forces, torque. Linear and angular motion, uniform acceleration, friction, inertia, moment of inertia, dynamic equilibrium (translation/rotation), Energy, momentum. Teaching learning Method • Lecture

			Numerical to solve
2	T-20	- To understand simple stress and strain of material under load. - Able to solve the numerical related to stress and strain.	Simple stress & Strain: Definition of stress and strains, factor of safety stress, modulus of elasticity, longitudinal strain and internal strains. Poisson's ratio etc. stress and strain curve, statement of formulae relating between different modules, simple problems to understand the above principles of composite bars-formula relating to loads and strains in individual members simple to understand the above relations. Teaching learning Method - Lecture - Numerical to solve
3	P-20	To understand the definitions and the formulas.	General: Practices on parallel and non-parallel forces, torque. Linear and angular motion, uniform acceleration, friction, inertia. Teaching learning Method - Lecture - Numerical to solve
4	T-20	- To describe bending property of bars - Able to solve the numerical related to design concept.	Design concept: Buckling, theories in failure, fatigue and stress concentrations, connections, Shear force and bending moment diagrams, centroids, 2nd moment of area and mass, theorem of parallel axes, bending stress, torsional stress of circular shafts, combined axial and bending stresses. Combined and torsional stresses, combined axial bending torsional stresses. Open and closed helical springs and beam deflection. Teaching learning Method - Lecture - Numerical to solve
5	T-10	To understand control system	Control systems: Introduction to control theory and its applications in Prosthetics and Orthotics. Teaching learning Method Lecture
6	T-10	To know basics of ergonomics	Ergonomics with applied mechanics General: definition and scope in modern industrial social studies on Machinery man

			oriented topics. Displays devices for transmitting information from machine to man. Controls in information from man to machine. Safety factors, Pollution, noise, fumes, atmospheric pollution if motion study in relation to Ergonomics principles. Teaching learning Method Lecture
--	--	--	---

BPO/105 BIOMECHANICS-I

Time : 60 hours of theory

Course Description:

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

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

- 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 temporal spatial, kinematic and kinetic information to distinguish between normal and abnormal function of the upper limbs, lower limbs & Spine.
- Analyse the forces at a skeletal joint for various static and dynamic activities.
- Demonstrate the ability to analyze 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.

Unit	Time (Hrs)	Specific Learning Objectives	Content and Teaching learning Method
1	T- 15	- Describe the kinetics and kinematics. - Describe the forces in its characteristics. - Describe the lever system - Describe the relation between force, pressure and area - Describe equilibrium	Basic Concepts in Biomechanics: Kinematics and Kinetics a) Plane & Axis b) Types of Motion, c) Location of Motion d) Direction of Motion e) Magnitude of Motion f) Objects in Motion g) Definition of Forces h) Force components i) Force of Gravity j) Reaction forces k) Force of Friction l) Concurrent force systems m) Parallel force systems n) Work o) Moment arm of force (Lever) p) Equilibrium q) Equilibrium of levers r) Pressure Teaching learning Method - Lecture discussion - Group discussion/activity - AV aids
2	T- 15	Explain the mechanism of how the foot reacts during human movement.	Joint structure and Function a) Joint design b) Materials used in human joints c) General properties of connective tissues d) Human joint design e) Joint function f) Joint motion Teaching learning Method - Lecture discussion - Group discussion - AV aids
3	T-30	- To explain the normal gait. - Explain the biomechanics of foot and ankle joint. - Explain the biomechanical principles of different design	Introduction to Normal Human Locomotion, Biomechanics of Ankle & Foot, Biomechanics of Foot & ankle foot orthosis. Biomechanics of Symes prosthesis, partial foot prosthesis, below knee (trans tibial) Prosthesis Teaching learning Method - Lecture discussion - Group discussion

		of Prosthesis and orthosis.	• AV aids • live demonstration
--	--	-----------------------------	---

BPO/106 BASIC ELECTRONICS

Time : 60 hours of theory

Course Description:

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

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

- Explain basic concept of electricity and electronics covering following:
- DC circuits, inductance and capacitance, AC circuits, power, supplies, amplifiers, feedback, interference rejection techniques, myoelectrodes and bioelectricity.
- Explain electronics measuring system.
- Explain safety practice of electricity

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-9	▶ Able to understand the basic concept of Electricity.	Electricity Basic Concepts: Introduction to SI System of units, charge, current, resistance, potential differences, electromotive force, Energy power, Voltage and current Relationship, energy storage, DC circuits, AC circuits, sine wave, Frequency, Period, phase, RMS value, inductive and capacitive reactance. Teaching learning Method • Lecture discussion • Explain using charts
2	T-6	▶ Able to understand the basic concept of resistors.	Resistors: Resistors sensitive to temperature, strain and light, Resistors in series and in parallel. Teaching learning Method • Lecture discussion • Explain using charts
3	T-6	▶ Able to understand the basic concept of transformers.	Transformers: Principle of the transformer, voltage, turns and current ratios. Teaching learning Method • Lecture discussion • Explain using charts

4	T- 6	▶ Able to understand the basic concept of semiconductors.	Semi Conductors: Outline Concepts of semiconductors and insulators. Conduction in intrinsic and extrinsic semiconductors. Teaching learning Method • Lecture discussion • Explain using charts
5	T-6	▶ Able to understand the basic concept of Amplifiers.	Amplifiers: Amplifiers as a system element. Operational amplifiers and their ideal characteristics. The small single equivalent circuit having a controlled source. Voltage and current gain, the decibel power gain, Noise and drift voltages, Source in amplifiers and bio-systems. Teaching learning Method • Lecture discussion • Explain using charts
6	T-6	▶ Able to understand the feedback system.	Feed Back: The general Feedback equation, Feedback Voltage series, negative feedback and loop gain, loop gain Accuracy, input resistance, output resistance, band width of noise. Feedback as a control mechanism in the wider sense, Positive feedback – instability and self-oscillation in amplifiers and oscillations. Teaching learning Method • Lecture discussion • Explain using charts
7	T-6	▶ Able to understand the measurement system	Measurements: Electronics measuring instruments.. Summary of recording instruments. Concepts of resolution and accuracy applied to digital and analogue instruments. Transducers for temperature, light, pressure, sounds, description, specification and use in circuit. Teaching learning Method • Lecture discussion • Explain using charts
8	T-6	▶ Able to understand the basic concept of myoelectrodes	Myoelectrodes: Technology of metal and metal paste electrodes, the equivalent circuit between electrodes, stability, source of unwanted voltage electrode systems. Other types of myoelectrodes micro electrodes, implanted electrodes, comparison with surface electrodes. Sensors,

			microprocessors etc. Teaching learning Method • Lecture discussion • Explain using charts
9	T-6	▶ Able to describe about safety practice of electricity	Electrical Safety: Description of single phase and three phase supply system and voltage involved. Function of line, natural and earth in single phase system. Current practice in pin connection and colour codes. Simple safety procedure to be taken when servicing equipment. Effect on safety of fault conditions. Fuses, Conductors and earth leakage detectors – miniature circuit breakers (MCB). Voltage regulators integrated circuits. Teaching learning Method • Lecture discussion • Explain using charts
10	T-3	▶ Able to understand the basic concept of bio-electricity	Bio Electricity: Biological Potentials, Muscle action potentials, Electro-myography and Myo-electricity Teaching learning Method • Lecture discussion • Explain using charts

BPO/107 PROSTHETIC SCIENCE-I

Time : 80 hours of theory

Theory

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the 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.

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

- 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 prosthetic solutions including, etiology, clinical presentation, prognosis and appropriate device management.
- Demonstrate empathy between Prosthetics 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 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 components.
- Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
- Understand and describe the roles of key members of the health care team and Identify how they interrelate with the Prosthetist and Orthotists.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-2	▶ Describe the prosthesis, and its historical development.	Introduction: Introduction to Prosthetics, definitions of various terminologies, Historical development in Lower Extremity Prosthetics in India and abroad. Teaching learning Method • Lecture discussion • Explain using charts • Models
2	T- 9	▶ Describe the different parts, components, functions, indications. ▶ Fabrication of SACH foot with local resources. ▶ Comparative studies of prosthetic foot. ▶ Various kinds of ankle mechanisms ▶ Pattern markings for custom made prosthetic foot.	Prosthetic Feet: Classes of Various types of Prosthetic feet. Teaching learning Method • Lecture discussion • Explain using charts • Demonstration of pattern markings
3	T- 15	▶ Describe the indications and prescription criteria for partial foot prostheses.	Partial foot Prostheses: Various types of Partial foot prosthesis. Biomechanics of Partial foot prosthesis, Prescription Principles, Materials used for partial foot prosthesis, various casting &

		▶ Able to explain the fabrication procedure.	fabrication techniques of Partial foot prosthesis. Teaching learning Method • Lecture discussion • Explain using charts • Models
4	T-15	▶ Describe the indications and prescription criteria for Symes prostheses. ▶ Able to explain the fabrication procedure for end & non end weight bearing syme's prosthesis.	Syme's: Various types of Symes Prosthesis, Prosthetic components, Prescription criteria, Principles. Materials used for Symes prosthesis, casting techniques. Cast modification. Fabrication & alignment techniques of different types of Syme's prosthesis. Teaching learning Method • Lecture discussion • Explain using charts • Models
5	T-30	▶ Describe the indications and prescription criteria for different types of transtibial prostheses. ▶ Able to explain the fabrication procedure of endo/ exoskeletal transtibial prosthesis with different socket designs & types. ▶ Able to explain the different suspension system & alignment techniques for transtibial prosthesis.	Trans Tibial: Various types of trans-tibial prostheses technology, Prosthetics Components – both conventional and modular. Trans-tibial, Prosthetic Prescription Criteria and principles. Materials used in Trans-tibial Prosthesis. Measurement and casting techniques for Trans-tibial prosthesis. Cast modification. Fabrication techniques for transtibial, Modular and Conventional Prosthesis. –Different types of socket designs – PTB, PTS, PTBSC, PTB-SCSP, TSB, open and close ended socket etc. Different types of suspension. Alignment techniques of transtibial prosthesis. Teaching learning Method • Lecture discussion • Explain using charts • Models
6	T-9	▶ Describe the Gait deviations of all below knee prosthesis.	Gait Deviations and Analysis: Person with Chopart, Symes, Trans-tibial prosthesis. Check Out Procedures with Chopart, Symes, Trans- tibial prosthesis.

		► Explain the checkout procedures for all below knee prosthesis.	Teaching learning Method • Quality check out forms • videos • Live Models
--	--	---	---

BPO/108 ORTHOTIC SCIENCE-I

Time : 80 hours of theory

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the Orthotic 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.

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

- 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 solutions including, etiology, clinical presentation, prognosis and appropriate device management.
- Demonstrate empathy between Orthotic theory and the environment in which the patient 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 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 orthotic components.
- Formulate appropriate orthotic prescriptions for wide range clinical situations.
- Understand and describe the roles of key members of the health care team and identify how they interrelate with the Prosthetist & Orthotist.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 9	- Describe the orthosis, and its history. - Able to select the appropriate materials to fabricate orthosis. - Explain different foot and ankle deformities.	General: Introduction to Orthotics, definitions of various terminologies, History of Orthoses in India and abroad. Various materials used in Orthotics. Foot & Ankle Deformities. Teaching learning Method - Lecture discussion - poster - sample of different materials
Different types of orthoses: Users/Client's assessment and prescription criteria, Measuring and casting, cast modification, three point force system, fabrication, fitting, aligning, checking out and finishing of the following devices:			
3	T- 24	- Able to describe all type of shoe modification and its indication. - Able to describe the fabrication procedure of foot orthosis.	Pedorthotics: Medial/Lateral raise (Inside /outside shoe), M.T. Bar (Inside / Outside shoe), Arch support, Meta tarsal pad, Calcaneal heel wedge, Heel raise, Thomas Heel, Heel pad for Calcaneal spur, "T" strap (Medial and lateral), Fixation of stirrup plate in shoes/ Sandal, Various types of Arch Supports – flexible/semi rigid/rigid/ custom moulded, SMO-Custom moulded Supra malleolar orthosis. Various types of Foot Orthoses for diabetic feet and other sensory deficiencies. Teaching learning Method - Lecture discussion - Practical demonstration - Model
4	T – 24	Able to describe different design of AFO, its indication, trim lines and fabrication procedure.	AFO (Ankle foot orthosis): Conventional AFO-, Custom made AFO (Articulated and Non-articulated A.F.O & various types of ankle joints) Teaching learning Method - Lecture discussion - Practical demonstration
5	T – 9	- Able to describe about club foot and its management. - Able to assess the patient with club foot.	Club foot orthosis: Orthotic management of CTEV, Ankle support Teaching learning Method Lecture discussion

			• Practical demonstration • Model
	T – 5	▶ Able to describe about anesthetic foot. ▶ Able to fabricate different types of foot orthoses for anesthetic foot.	Anesthetic Foot: Orthotic management of Anesthetic Foot.
6	T – 9	▶ Able to describe fracture and its management.	Fracture brace: Orthosis for the management of below knee fracture. Teaching learning Method • Lecture discussion • Practical demonstration • Model

BPO/151 PRACTICAL PROSTHETIC SCIENCE-I

Time : 220 hours of practical

Course Description:

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.

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

- Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal prosthetic 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 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.
- Identify, prescribe and justify selection of appropriate materials and component 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 trim lines.
- Identify problems related to device fit and/or alignment and be able to suggest

and implement appropriate correction.

- Assess and solve 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 patient/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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P - 6	▶ Demonstrate the method of amputee history taking. ▶ Demonstrate the method of collecting personal & medical factors as history. ▶ Able to communicate effectively to get the relevant history from the participants.	▶ Taking case history of a minimum of 10 individuals/ Patients Teaching learning Method ▶ Models/ User ▶ Forms ▶ Verbal questionnaire
2	P - 30	▶ Able to explain the fabrication procedure of custom made prosthetic feet. ▶ Improve the practical hand skill using different P&O tools. ▶ Able to make the pattern for the different sized prosthetic foot.	▶ Fabrication of Prosthetic Feet. Teaching learning Method ▶ Models ▶ Practical
3	P - 18	▶ Able to explain the fabrication procedure of different designs of partial foot prosthesis	▶ Assessment, measurement, casting & fabrication of Partial foot prosthesis on model/ mannequins Teaching learning Method ▶ Models/ mannequins ▶ Practical
4	P - 36	▶ Able to explain the fabrication procedure of Chopart prosthesis. ▶ Able to fabricate chopart prosthesis.	▶ Assessment, measurement, casting & fabrication of Chopart Prosthesis on model/ mannequins. Teaching learning Method

		▶ Able to self-evaluate the practical skills of partial foot prosthesis.	▶ Models/ mannequins ▶ Practical
5	P - 42	▶ Able to explain the fabrication procedure of symes prosthesis. ▶ Able to fabricate the end/ non end weight bearing symes prosthesis. ▶ Able to fit the symes prosthesis and to carry out the necessary corrections/ remedies if required. ▶ Able to self-evaluate the practical skills of partial foot prosthesis.	▶ Assessment, measurement, casting & fabrication of Symes Prosthesis on model/ mannequins Teaching learning Method ▶ Models/ mannequins ▶ Practical
6	P - 88	▶ Able to explain the fabrication procedure of various transtibial prosthesis. ▶ Able to fabricate the endoskeletal metallic & PP technology transtibial prosthesis. ▶ Able to fit the transtibial prosthesis and to carry out the necessary corrections/ remedies if required. ▶ Able to fabricate the supracondylar cuff suspension for transtibial PTB prosthesis. ▶ Able to self-evaluate the practical skills of partial foot prosthesis.	▶ Assessment, measurement, casting & fabrication of Trans-tibial prosthesis on model/mannequins. Teaching learning Method ▶ Models/ mannequins ▶ Practical

BPO/152 PRACTICAL ORTHOTIC SCIENCE-I

Time : 220 hours of practical

Course Description:

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.

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

- Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal orthotic 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 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 patient/client at the centre.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P- 30	▶ Demonstrate the method of amputee history taking. ▶ Demonstrate the method of collecting personal & medical factors as history. ▶ Able to communicate effectively to get the relevant history from the participants.	▶ Taking case history of a minimum of 10 individuals/ Patients Teaching learning Method ▶ Models/ User ▶ Forms
2	P- 30	▶ Able to explain the fabrication procedure of foot orthosis	▶ Assessment, Evaluation & fabrication of Different types of foot Orthoses on model/mannequins. Teaching learning Method ▶ Models/ mannequins ▶ Practical
3	P- 18	▶ Able to explain the fabrication procedure of different shoe modification	▶ Assessment & Evaluation of Shoe Modifications Teaching learning Method ▶ Models/ mannequins ▶ Practical
4	P- 118	▶ Able to explain the fabrication procedure of different types of A.F.O. and Ankle joints	▶ Assessment, casing & fabrication of all types of Mechanical Ankle Joint, conventional & Custom moulded (A.F.O.) on model/ mannequins Teaching learning Method ▶ Models/ mannequins ▶ Practical
5	P- 24	▶ Able to explain the fabrication procedure of functional fracture orthosis	▶ Assessment, casing & fabrication of functional fracture Orthosis for below knee on model/ mannequins. Teaching learning Method ▶ Models/ mannequins ▶ Practical

CONSTITUTION OF INDIA

Time : 20 hours of theory

Course Description:

The course is designed to assist the students to develop understanding of the constitution and fundamental rights and special rights under constitution of India.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T - 6	Describe constitution, its meaning and making in India	Meaning of the term "Constitution" making of the Indian Constitution 1946-49 Teaching learning Method Lecture discussion
3	T - 14	Describe fundamental rights and duties	- Fundamental Rights and Duties... Their content and significance. Teaching learning Method - Lecture discussion

KANNADA

Time : 30 hours of theory

Course Description:

The course is designed to assist the students to communicate in Kannada with service user and their parents/caregivers coming to institution for P&O related services.

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

- To ensure student have knowledge of Kannada words related to P & O service.
- Introduce Kannada for non Kannadigas.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 12	▶ Recognize and read alphabets ▶ Learn commonly used words ▶ Able to syntheses word to form sentence. ▶ Demonstrate essay and letter writing.	▶ Alphabets including Vowels, Consonants. ▶ Numbers:- 1 to 10 & 100 ▶ Word, Phrase, Sentence formation, Letter writing & Essay writing Teaching learning Method ▶ Group Activity ▶ Lecture discussion
2	T- 9	▶ Know different terminology/ words used while P&O service delivery in Kannada	Words related to P & O service delivery and various terminology (Commonly used P & O related words from English to Kannada) Teaching learning Method ▶ Group Activity ▶ Lecture discussion
3	T- 9	▶ Demonstrate communication with service user and among team members	Commonly occurring conversation between the Service user and P & O a) Question types sentences b) Those sentences which helps to communicate between P&O and other colleagues Teaching learning Method ▶ Group Activity ▶ Lecture discussion

SECOND YEAR

BPO/201 PATHOLOGY

Time : 80 hours of theory

Course Description:

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 Prosthetist/Orthotist. In addition, s/he should be able to advise on care and appropriate treatment options.

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 (musculoskeletal system and nervous system, vascular system).

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-15	▶ Describe the common terminologies, aims & objectives of pathology ▶ Explain about the mechanism of the inflammation & Infections.	a. General: Introduction to pathology, basic mechanism of health and disease, Clarification of disease. Inflammation – Acute inflammation: features, causes, vascular and cellular events. Chronic inflammation: Causes, Types, Classification, Repair, Wound healing by primary and secondary union, factors promoting and delaying the process. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
2	T-18	▶ Describe about Ischemia, necrosis, gangrene, thrombosis, embolism and infarction,	b. Hemodynamic disorders, thrombo embolic disease & shock. i. Ischemic, necrosis, thrombosis, embolism, Infarction, shock. ii. Gangrene. iii. Thromboangitis obliterans.

		thromboangiitis obliterans.	Neoplasia – Definition, classification, Biological behaviour: Benign and Malignant, Carcinoma and Sarcoma, principles of their spread. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
3	T- 8	► Describe briefly about hyper-sensitivity and about allergy reactions.	c. Hypersensitivity diseases and immunity – Brief overview of hypersensitivity reaction allergies & auto immune diseases. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
4	T- 9	► Describe the pathology of genetic disorders.	d. Genetic disorders – Brief over view of genetic disease. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
5	T-12	► Explain about the Cerebro vascular disorders, Injuries to brain & spinal cord, & Peripheral nerves.	e. Neurovascular diseases i. Outline of Cerebro-vascular disorders ii. Trauma to brain and spinal cord. iii. Demyelinating diseases like multiple sclerosis. iv. Degenerative diseases like parkinsonism disease. v. Peripheral vascular disease vi. Poliomyelitis Teaching learning Method • Lecture discussion • Group discussion • AV aids
6	T-9	► Explain the pathogenesis of diabetes in detail.	f. Metabolic disorders – Diabetic mellitus-Types, Pathogenesis, Pathology, Laboratory diagnosis Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
7	T-9	► Describe the disorder of blood	g. Disorders of blood. Constituents of blood and bone marrow,

			Regulation of hematopoiesis. Anemia: Classification, clinical features & lab diagnosis Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
--	--	--	---

BPO/202 ORTHOPAEDICS, AMPUTATION SURGERY & IMAGING SCIENCE

Time : 80 hours of theory
: 20 hours of practical

Course Description:

In this unit the students learn about the various orthopedic conditions in detail with review of the disabling conditions. It also covers the various common surgical techniques and its influences in the orthotics and prosthetics fit and design.

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

- Have an understanding of different clinical conditions that may indirectly impact on the clients' ability to successfully rehabilitate using the device.
- Explain the management of different disabling conditions.
- Explain the principles of amputations and revision amputation, types and techniques
- Explain the post-operative care of the stump and stump hygiene
- Describe the stump dermatology and the common skin diseases and management.
- Describe and fabricate the post-operative fitting in the lower extremity.
- Describe common surgical technique and how they may influence prosthetics and Orthotics fit and design

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 3	▶ Describe Principles of Orthopaedics, and investigative procedures -X-ray.	General: General: Introduction, Principles of Orthopaedics. Common investigative procedures. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
2	T- 9 P- 3	▶ Describe fracture, its types and management ▶ Describe & identify dislocation,	Traumatology: Fracture - definition, types, signs and symptoms and management. Subluxation/dislocations – definition, signs and symptoms, management.

		subluxation and general management.	Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids. • Live model if possible
3	T- 6	► Description and general management of inflammatory and degenerative conditions.	Inflammatory and Degenerative Conditions: Osteomyelitis, arthritis and arthroses, eg - Inflammation of Joints, Rheumatoid Arthritis, infective arthritis, tuberculosis arthritis, Osteoarthritis, Ankylosing spondylitis, arthritis of hemophilic joints, Neuropathic joints. Inflammation of tendon sheath and bursa, Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids • Live model
4	T- 6	► Describe the metabolic disorders and its management.	Disease of Bones and Joints Metabolic diseases of bones, e.g. rickets, Osteomalacia, Osteopenia, Osteoporosis, gout, scurvy etc. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids • Live model
5	T- 6	► Identify & describe the congenital deformities and its general management.	Congenital Deformities Outline of Torticollis, spina bifida, spinal anomalies, scoliosis, C.T.E.V. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids • Live model
6	T- 6 P- 2	► Describe & identify the acquired deformities of joints.	Acquired Deformities: Scoliosis – all types, kyphosis, Lordosis, spondylosis, Coxa -vara, coxa-valga and coxa magna, Otto pelvis, genu valgum, genu varum, genu recurvatum. Teaching learning Method • Lecture discussion

			• Group discussion/activity • AV aids • Live model
7	T- 3	► Describe the cervical and lumbar regions.	Cervical and Lumbar Pathology: Prolapse of intervertebral disc, Spinal cord injury. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
8	T- 15 P- 6	► definition, clinical features and management of the following Regional conditions in detail.	Regional Conditions: Definition, Clinical features and management of the following regional conditions : Hip: Outline of dislocations and subluxations & dysplasia (congenital, traumatic, pathological, paralytic, spastic and central). Knee: Outline of Meniscal tears, dislocation of patella, Ligamentous injuries. Ankle & foot: Outline of partial and total ligamentous injuries Sprain, Heel and foot deformities (Calcaneo varus, Pes Valgus, varus, Metatarsalgia, plantar fasciitis, Anesthetic feet, Bunion of toe, Hallux Valgus) Shoulder: Outline of Recurrent dislocation, Bicipital tendinitis and peri-arthritis. Elbow and forearm: Outline of Cubitus varus and valgus, Madelung's deformity, Tennis elbow, Volkmann's contracture, Dupuytren's disease, De Quervain's disease, entrapment neuropathies. Wrist & Hand: wrist drop, Tenosynovitis, mallet finger, carpal tunnel syndrome, claw Hand. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids. • Live models/patients
9	T- 6	► Understand the specific disorders	Specific Disorders: Leprosy, Burns, Tumors – Benign & malignant, Tuberculosis & Perthes

		and its management.	Disease, AVN (Full), Peripheral Nerve Injuries, Congenital anomalies, Muscular Dystrophy etc. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
10	T- 5	▶ Brief about sports injury and its management.	Sports injuries and their management. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids
11	T- 15 P- 3	▶ Describe amputation, indications, type, surgical & prosthetic management. ▶ Describe ideal stump and its prosthetic management.	Amputation Surgery General: Indications/causes, General Principles, Types of amputation, i.e. Guillotine, Flap, Osteoplastic, Myoplastic, Osteo-myoplastic. Individual's Preparation for prosthesis. Ideal stump. Preoperative, operative and postoperative prosthetic management techniques in general. Amputation: Amputation surgery in lower and upper limbs, stump refashioning and amputation revision. Amputation in special circumstances, like in infants and children, Congenital limb deficiencies and its universal classification, ischemic limbs, elderly persons, malignancy and Diabetes, Osteo-integration and Osteogenesis imperfecta. Congenital anomalies, podiatry, burns. Teaching learning Method • Lecture discussion • Group discussion/activity • AV aids • Live models/patients.
12	P- 3	▶ Describe different imaging techniques	Different Imaging Techniques: X-ray, Sonography, CT Scan & MRI Teaching learning Method • Lecture discussion • X-ray films • MRI films • CT scan films • Sonography films

13	P - 3	► Identification on relevant x-ray and measurement of deformity, its assessment and management.	Demonstration of different conditions & relevant x-ray films, how to read from x-ray, how to measure the deformity from x-ray like Cobb's & Rib angle measurement etc. Assessment and P&O management. Teaching learning Method • Lecture discussion • X-ray films
----	-------	---	---

BPO/203 COMMUNITY REHABILITATION & DISABILITY PREVENTION

Time : 60 hours of theory

Course Description:

The course is designed to assist the students to develop understanding of the health and socio-economic context of people with disabilities in the community.

The student should be able to meet the following learning objectives

- Recognise members of the clinic team and identify benefits associated with a team approach
- Describe and discuss theoretical principles of Physiotherapy & Occupational Therapy.
- Describe theories related to the psychology of loss and disability;
- Discuss the social causes of disability in India and the link between poverty and disability.
- Reflect and analyse on their attitude/values and attitudes towards persons with disabilities, their families and the community (Socio-cultural and religious)
- Explain the UN convention rights and role as Prosthetist and Orthotist
- Explain the different approaches to rehabilitation.
- Explain different component of CBR and the guiding principles of CBR implementation.
- Explain P & O role in a CBR programme.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 9	► Explain about normal posture and movements.	Normal Posture: definition & description, static and dynamic, alignments of various joints, centre of gravity, planes & muscular moments, and Analysis of posture Movements: Anatomical definition and description, Movements and exercise as therapeutic modality and their effects, Physiological reaction of exercise.

		▶ Explain traction and therapeutic techniques ▶ Describe and practice muscle testing techniques	Traction: Rational, Technique, indications & contra indications. Therapeutic Techniques: Electrotherapy, Heat therapy, Hydrotherapy, Exercise Therapy Muscle Testing: Concept, introduction, significance and limitations. Grade systems, techniques of muscle testing, goniometry. Teaching learning Method • Lecture discussion • Demonstration • Group activity/ discussion
2	T- 9	▶ Brief about the child development and assessment ▶ Demonstrate the techniques.	Child development in brief - milestone and delayed milestone. Assessment procedure, Evaluation of muscle power, range of motion, checking of joint stability. Functional Assessment including Activities of Daily Living (ADL), stretching, Pre-prosthetic management, Exercise through games involving parents or guardians, Stump bandaging application etc. Teaching learning Method • Lecture discussion • Demonstration • Group activity/ discussion
3	T- 6	▶ Explain about various terminology related to disabilities and its classification. ▶ Explain various disabilities issues and schemes	Introduction to impairment, disability and handicap and International Classification of Functioning, Disability and Health (ICF). Introduction to disability issues, Government schemes and initiatives, legislation and UNCRPD. Teaching learning Method • Lecture discussion • Group activity/ discussion
4	T- 21	▶ Explain the specific disorder in detail – Definition, causes, signs and symptom, different types of management. ▶ Explain in brief about the different approach of	Specific disorders and management: Peripheral nerve injuries. Poliomyelitis, Cerebral Palsy, Muscular Dystrophy, Club foot (CTEV), Spina Bifida, Hemiplegia, Spinal Cord injuries (paraplegia/ Quadriplegia), ▪ General re-actions of motor unit ▪ Disease of peripheral nerves – inflammatory neuropathies, immune

		rehabilitation in relation with the disorder/ disability.	mediated infections, polyneuropathies [leprosy, etc., hereditary neuropathies, Acquired metabolic & toxic neuropathies, nutritional neuropathies, Traumatic neuropathies. ▪ Disease of skeletal muscle. ▪ Muscular dystrophies, Myotonic dystrophy. Teaching learning Method • Lecture discussion • Demonstration • Group activity/ discussion • Field visits
5	T-12	▶ Describe the concept of rehabilitation and role of each team member ▶ Describe in brief about physical medicine and examination procedures. ▶ Describe geriatric rehabilitation. ▶ Brief what is CBR & IBR ▶ Role of P & O in CBR	Concept of Comprehensive Rehabilitation, Rehabilitation team and role of each member of the team. Introduction to Physical Medicine, Principles of clinical examinations, diagnosis and treatment. Different aspects of physical medicine and rehabilitation. Rehabilitation aspects of other disabilities including visual, speech & hearing and mentally retarded and disability evaluation. Rehabilitation of Geriatric population: Problems related with ageing and their management. Introduction to Health care System, Rehabilitation in Health care, rehabilitation under various ministries, Introduction to Institute based rehabilitation (IBR) and Community Based Rehabilitation (CBR). Prosthetics & Orthotics in CBR and Role of CBR Workers in P&O. Teaching learning Method • Lecture discussion • Group activity/ discussion
6	T- 3	▶ Describe the role of different professional in CBR	Community Based Rehabilitation: CBR and its need – difference between IBR and CBR, Simple knowledge about other disabilities, its prevention and its management, Role of P&O Professionals in CBR, Role of other professionals in CBR, Early identification and early Intervention, How to work as a team in CBR/IBR structure, Simple techniques to make CBR activities more purposeful, Telemedicine.

			Teaching learning Method • Lecture discussion • Group activity/ discussion • Field visits
--	--	--	--

BPO/204 BIOMECHANICS - II

Time : 60 hours of theory
: 30 hours of practical

Course Description:

The understanding of bio-mechanical principles of prosthetics and orthotics will be the foundation of the work of the students. It is essential to have a sound theoretical knowledge of the subject and students are able to demonstrate the rigorous application of these principles to practical P&O situations and in the analysis of those situations.

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

- 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 & Spine.
- Analyse the forces at a skeletal joint for various static and dynamic activities.
- Demonstrate the ability to analyzer 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 15	▶ Describe the mechanical properties of different tissues. ▶ Explain the biomechanics of hip and knee joints	Tissue Mechanics: Study of mechanical characteristics and function of bones, skin, ligaments, cartilage and muscles. Biomechanics of hip, biomechanics of knee. Teaching learning Method • Lecture discussion • Group Discussion • Explain using charts

2	T- 6 P- 6	▶ Understand the posture, normal and pathological walking pattern of human body. ▶ To have basic idea of EMG.	Posture & Gait: Normal gait: general features of gait, gait initiation, kinematics and kinetics of gait, energy requirements, Pathological gait Introduction to EMG studies and recording EMG. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
3	T- 9	▶ Describe the analysis of force at each joint during gait cycle.	Joint Force Analysis: Body segment parameters, joint forces during swing and stance phase, force analysis of foot and ankle joint, knee joint and hip joint. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
4	T- 12	▶ To know different ways to analyze the gait. ▶ To know various factor which can alter the gait ▶ Explain the biomechanical principles of different design of Prosthetics and Orthotics	Human locomotion and Gait analysis: Introduction to different ways to do gait analysis by using force plate/TV analysis/ electromyography studies, energy studies, gait repeatability, variation due to age, variation due to footwear, Orthoses/Prostheses. Trans Femoral Amputee, gait analysis and deviations, gait variations due to alignment or pathological conditions. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids • Live demonstration
5	T- 3 P- 6	▶ Able to understand the criterion for prescription for through knee prostheses. ▶ Able to explain the socket biomechanics and alignment techniques for the same.	Through knee Biomechanics: Through knee prescription principles, socket biomechanics and alignment techniques. Teaching learning Method • Lecture discussion • Explain using charts • videos, live amputees
6	T- 3	▶ Able to understand	Trans Femoral Prosthetics

	P- 6	the criterion for prescription for above knee prostheses. ▶ Able to explain the socket biomechanics and alignment techniques for the same. ▶ A proper understanding of the components	Biomechanics: General Socket biomechanics, Trans Femoral socket biomechanics and analysis of socket forces. Analysis of Trans Femoral Prosthetic components. Teaching learning Method • Lecture discussion • Explain using charts • Videos • Live amputees
7	T- 6 P- 6	▶ Able to explain the gait deviation of P&O device.	Gait deviation: Gait deviation while using while using Foot Orthoses (FO), Ankle Foot Orthoses (AFO) and trans-tibial prostheses. Teaching learning Method • Lecture discussion • Videos • Live amputees
8	T- 6 P- 6	▶ Able to understand and explain the biomechanical principles involved in prescription and design of various kinds of above knee orthoses like KAFO, FRO, HKAFO, force systems. ▶ Understanding of the orthotic gait deviations and the reasons. ▶ Students will have the idea of various types of crutches. ▶ Able to describe the bending property of bars	Above knee Orthotics Biomechanics: Biomechanical principals of various kinds of above knee Orthosis especially Knee Ankle Foot Orthosis and Floor Reaction Orthosis. Biomechanics of HKAFO especially to prevent scissoring. Three/ four/five point force system. KAFO and HKAFO gait deviations due to alignments or pathological conditions. Gait analysis of KAFOs and HKAFOs with various types of crutches. Teaching learning Method • Lecture discussion • Explain using charts • Videos • live amputees

BPO/205 PSYCHOLOGY AND SOCIOLOGY**Time** : 60 hours of theory**Course Description:**

The course is designed to assist the students to develop understanding of human psychology which emphasize on various behavioral patterns of individuals, theories of development, personality and moral development, cognitive skills and learning process. This unit also discuss on psychological aspect of disability, role of parents/caregivers and acceptance of disability. Sociology will introduce student to the basic sociology concepts, principles and social process, social organisations working for persons with disabilities and their role in prosthetics and orthotics. The study of these subjects will help the student to understand their service users and plan appropriate intervention plan.

The student should be able to meet the following learning objectives

- Describe the different stages of development, behaviour patterns of individuals and psychological development
- Explain the theories and assessment of intelligence
- Describe the theories of learning, factors affecting learning and effective way of learning
- Describe the psychological aspect of disability and role of parents/caregivers of persons with disability
- Describe the social factors in health and disability and social problems of persons with disabilities
- Explain the functions of social organisations and role of prosthetics and orthotics.

Unit	Time (Hrs)	Specific Learning Objectives	Content and Teaching learning Method
1	T- 30	▶ Describe the stages of human development ▶ Explain the theories of intelligence, learning and effective way of learning ▶ Describe the role of family/ caregivers of persons with severe disabilities ▶ Describe the social factors affecting health & disability ▶ Explain the functions of social institutions/ NGO's and role of P&O.	A. Psychology & Social work: Introduction to Psychology, Outline of Psychology and behavior, Intelligence and abilities, Learning and Remembering, Psychological Development, Cognitive Processes, Personality, Moral Development, Psychological aspect of disability. The Role of the Family, Child with the disability, parents of the disabled child. Acceptance of Severely disabled persons. Social-Sexual Relationships. Independent Living. Introduction to Sociology and outline of Society, definitions, Outline of Social works, Nature of Social organization, types of organizations. Nongovernmental organizations and its role in prosthetics & orthotics. Structure and functions of Social

			Institutions. Village as a community. Social Changes, Social Problems, Social Welfare, Vocational Rehabilitation, Employment, Self-Employment Job analysis, Job placement. Teaching learning Method • Lecture discussion • Field trips
2	T- 30	► Explain about disability and development.	Disability & Development: Background to social, political and economic issues in India and other Low Income countries. Affect on poor who live in rural and urban areas. Disability and women. Introduction to community based rehabilitation as compared to the existing medical model and its function. Local resources available and referral. Income generation schemes, Purpose of Sangha/group of PWDs. Access, adaptations and change of environment where people live or work. Removing Environmental Barriers, Recreation for the Disabled Community Welfare organizations, Social welfare programmes. Professional and social work in medical & Rehabilitation set up. Practical and environmental difficulties of patients in use of appliances. Outline of Educational aspects, PWD act. Teaching learning Method • Lecture discussion • Field visits

BPO/206 PROSTHETICS SCIENCE- II

Time : 80 hours of theory

Course Description:

This subject is delivered in a coordinated manner with the practical part of the 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.

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

- 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 prosthetic solutions including, aetiology, clinical presentation, prognosis and appropriate device management.
- Demonstrate empathy between Prosthetics 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 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 components.
- Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
- Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the prosthetist.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 12	▶ Describe different types of knee joint and it functions. ▶ Describe the classifications of prosthetic knee joints base on their functions.	Knee Joints: Different types of Endoskeletal and exoskeletal knee joints - Single axis knee joints, Polycentric knee joints, Free knee, Constant friction knee joints, Variable friction Knee joint, microchip control knee, hydraulic knee joint, swing Phase control knee joints, Stance Phase control knee joints etc. Teaching learning Method • Lecture discussion • Explain using charts

			• Models
2	T-8	► Describe the different type of hip joints.	Hip Joints: For above knee as well as for hip disarticulation/ hemi- pelvectomy – all types of hip joints especially single axis and Swivel type. Teaching learning Method • Lecture discussion • Explain using charts • Models
3	T-21	► Describe the indications and prescription criteria for through knee prostheses ► To be able to explain the fabrication of through knee prosthesis.	Through Knee Prosthesis: Various types of through knee prosthesis - Through knee prosthetic Components. Materials used for through knee prosthesis. Casting techniques for through knee prosthesis, Cast modification, Fabrication Techniques of through hip prosthesis, through knee Gait analysis and deviations, Through knee Check-out Procedures. Teaching learning Method • Lecture discussion • Explain using charts • Models
4	T-21	► Describe the indications and prescription criteria for Trans femoral prostheses ► To be able to explain the fabrication of transfemoral prosthesis.	Trans Femoral Prosthesis: Types of Trans Femoral Prosthesis. Trans femoral Prosthetic Components. Trans Femoral Socket designs. Casting and measurement techniques, Cast modification, Fabrication techniques of Trans Femoral socket. Various types of suspension used in Trans Femoral Prosthesis Teaching learning Method • Lecture discussion • Explain using charts • Models
5	T-18	► To be able to check out and gait deviation of prostheses by using the different types of modular components.	Gait Deviations and Analysis: Trans Femoral Gait Analysis, Trans Femoral Check-out Procedures. Teaching learning Method • Lecture discussion • Explain using charts • Quality Check out form • Models

BPO/207 ORTHOTICS SCIENCE-II

Time : 80 hours of theory

Course Description:

This subject is delivered in a coordinated manner with the practical part of the orthotic 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.

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

- 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 solutions including, aetiology, clinical presentation, prognosis and appropriate device management.
- Demonstrate empathy between orthotic 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 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 orthotic components.
- Formulate appropriate orthotic prescriptions for wide range clinical situations.
- Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

Unit	Time 7(Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-32	▶ Able to understand the prescription criteria different type of orthosis. ▶ To know that the orthotic management of few conditions.	Orthotics Components: Prescription principles of various types of Knee Orthoses (KO), Knee Ankle foot Orthoses (KAFO), Hip Knee Ankle foot Orthoses (HKAFO). RGO & ARGO Orthoses All types of K.A.F.O., H.K.A.F.O. FRO, RGO & ARGO etc. and also Orthoses for management of C.D.H., C.P., Paraplegics, Legg Calve perthes diseases, Spina Bifida, Leprosy and Hemiplegia etc. Teaching learning Method

			• Lecture discussion • Explain using charts • Models
2	T-18	▶ Able to explain the fabrication procedure of different type of orthosis.	Fabrication: Cast and measurement techniques, appropriate selection of materials and components, cast modification, fabrication and alignment technique, using of different technologies – its advantages and disadvantages, Accommodation of limb length discrepancy while designing orthosis, Gait analysis and check out procedures. Teaching learning Method • Lecture discussion • Explain using charts • Models
3	T- 30	▶ Explain different types of above knee orthosis ▶ Explain orthoses in different conditions like sports injury, rickets and knee arthritis	Orthotics: Orthoses for sports injury, Reciprocating Gait Orthoses (RGO), Hip Guidance Orthoses(HGO), Fracture Cast Bracing, Swivel walker, orthopodium/ Parapodium. Weight relieving orthoses, Extension orthoses or Ortho-protheses, PTB Orthoses. Orthotic management of Rickets and Knee Arthritis Teaching learning Method • Lecture discussion • Explain using charts • Models

BPO/208 PHARMACOLOGY

Time : 60 hours of theory

Course Description:

The course is designed to assist the students to develop understanding of the drugs and its effects used in different diseases during the course of rehabilitation and how its use effects rehabilitation process.

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

- Understand the basics of drugs, pharmacokinetics, pharmacodynamics and drug allergy
- Describe drugs used in various pathological conditions.
- Explain the drugs in geriatrics population
- Understand the adverse effects of various drugs with special concern in geriatric.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 6	▶ Able to describe briefly about introduction, definition, classification and effects of drugs.	General Pharmacology: Introduction, Definitions, Classification of drugs, Sources of drugs, Routes of drug administration, Distribution of drugs, Metabolism and Excretion of drugs, Pharmacokinetics, Pharmacodynamics, Factors modifying drug response, Elementary knowledge of drug toxicity, drug allergy, drug resistance, drug potency, efficacy & drug antagonism. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
2	T- 6	▶ Able to describe about drugs related to Autonomic Nervous System.	Autonomic Nervous system: Cholinergic and Anti-Cholinergic drugs, Adrenergic and Adrenergic blocking drugs, Peripheral muscle relaxants. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
3	T- 6	▶ Able to describe briefly about Sedative-Hypnotic drugs.	Neuropharmacology (in brief): Sedative-Hypnotic Drugs: Barbiturates, Benzodiazepines, Antianxiety Drugs: Benzodiazepines, Other Anxiolytics, Drugs Used in Treatment of Mood Disorders: Monoamine Oxidase Inhibitors, Tricyclic Antidepressants, Atypical Antidepressants, Lithium, Antipsychotic drugs Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
4	T- 6	▶ Able to describe briefly about drugs used in treatment of movement disorders.	Disorders of Movement (in brief) : Drugs used in Treatment of Parkinson's Disease, Antiepileptic Drugs, Spasticity and Skeletal Muscle Relaxants Teaching learning Method • Lecture discussion • Group discussion/ activity

			• AV aids
5	T-15	▶ Able to describe briefly about drugs used in treatment of Inflammatory / Immune diseases & also for degenerative diseases.	Inflammatory/Immune Diseases: Non-narcotic Analgesics and Nonsteroidal Anti-Inflammatory Drugs, Acetaminophen, NSAIDs, Aspirin, Nonaspirin NSAIDs, drug Interactions with NSAIDs, Glucocorticoids: Pharmacological Uses of Glucocorticoids, adverse effects, Physiologic Use of Glucocorticoids Drugs Used in Treatment of Arthritic Diseases: Rheumatoid Arthritis, Osteoarthritis, Gout, Drugs Used in the Treatment of Neuromuscular Immune/Inflammatory Diseases: Myasthenia gravis, Idiopathic Inflammatory Myopathies, systemic lupus Erythmatosus, Scleroderma, Demyelinating Disease, Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
6	T- 9	▶ Able to describe briefly about the drugs related to the respiratory problems.	Respiratory Pharmacology (in brief): Obstructive Airway Diseases, Drugs used in Treatment of Obstructive airway Diseases, Allergic Rhinitis Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
7	T- 6	▶ Able to describe briefly about the drugs related to the gastrointestinal problems. ▶ Able to describe briefly about the medicines related to the treatment of Diabetes Mellitus.	Digestion and Metabolism (in brief): Gastrointestinal Pharmacology: Peptic Ulcer Disease, Constipation, Diarrhea, Drugs Used in Treatment of Diabetes Mellitus: Insulin, Oral Hypoglycemics Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
8	T- 6	▶ Able to describe briefly about the medicines related to the Geriatric	Geriatrics: Pharmacology and the geriatric Population: Adverse effects of special concern in the Elderly, Dementia, Postural hypotension, urinary incontinence.

		population.	Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
--	--	-------------	---

BPO/251 PRACTICAL PROSTHETICS SCIENCE- II

Time : 290 hours of practical

Course Description:

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.

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

- Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal prosthetic 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 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.
- 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 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P - 144	▶ Able to explain the fabrication procedure of above knee prosthesis. ▶ Able to fabricate endo & exoskeletal transfemoral prosthesis.	▶ All types of above Knee prosthesis Teaching learning Method ▶ Models/ mannequins - Practical
2	P - 96	▶ Able to explain the fabrication procedure of through knee prosthesis. ▶ Able to fabricate endo & exoskeletal through knee prosthesis.	▶ All types of through knee prosthesis Teaching learning Method ▶ Models/ mannequins - Practical
3	P - 50	▶ Able to explain the fabrication procedure of silicone cosmetic prosthesis	▶ Silicone Cosmetic prosthesis on model / mannequins Teaching learning Method ▶ Models/ mannequins - Practical

BPO/252 PRACTICAL ORTHOTICS SCIENCE-II

Time : 290 hours of practical

Course Description:

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.

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

- Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal orthotic 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 trim lines.
- Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
- Assess and solve orthotic problems as part of long term patient care.
- Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
- 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P- 24	▶ Able to explain the fabrication procedure of orthosis in LMN and UMN	▶ Orthoses in Lower Motor Neuron Disorders, Orthoses in Upper Motor Neuron Disorders Teaching learning Method ▶ Models/ User ▶ Forms
2	P- 57	▶ Able to explain the fabrication procedure of knee orthosis	▶ Various types of knee Orthoses Teaching learning Method ▶ Models ▶ Practical
3	P- 78	▶ Able to explain the fabrication procedure of weight relieving orthosis	▶ Weight relieving orthosis, Teaching learning Method ▶ Models/ mannequins ▶ Practical
4	P- 24	▶ Able to explain the fabrication procedure of floor reaction	▶ Floor reaction orthosis Teaching learning Method ▶ Models/ mannequins

		orthosis	▶ Practical
5	P- 18	▶ Able to explain the fabrication procedure of Toronto brace	▶ Toronto Brace Teaching learning Method ▶ Models/ mannequins ▶ Practical
6	P- 36	▶ Able to explain the fabrication procedure of Bilateral HKAFO	▶ Low cost Orthoses ▶ Bilateral H.K.A.F.O, Teaching learning Method ▶ Models/ mannequins ▶ Practical
7	P- 53	▶ Able to explain the fabrication procedure of orthosis for various conditions	▶ Orthoses in Arthritis, Orthoses in Fractures, Orthoses in Hemophilia, Orthoses in Progressive Muscular Dystrophy, Orthoses in Juvenile Disorders etc. Teaching learning Method ▶ Models/ mannequins ▶ Practical

Personal & Professional Studies

Time : 30 hours of theory

Course Description:

This subject focuses on development of both inter - personal skills and professional skills. This complements technical skills and is essential in order for the student to work successfully as a Prosthetist and Orthotist.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 6	The student learns to describe and demonstrate the communication process and to reflect on their own communication skills	Professional Communication - Importance of good communication, Verbal and non – verbal communication, Barriers to communication, aspects of effective communication, Communication in organizations. Teaching Learning Method • Lecture • Group discussion • Demonstration • Individual activity • Role play • Assignment

2	T- 3	The student to use the active listening technique component of counseling. The main focus will be on enabling the trainees to acquire practical skills in active listening.	Active listening skills -Definition of counseling and active listening, types active listening, the need for active listening, process and practice of active listening Teaching Learning Method • Lecture • Group discussion • Demonstration • Individual activity • Role play • Assignment
3	T- 9	Student should be able to use reflective practice as a method of self-development & describe how they will continue their personal and professional development on completion of the training programme.	Personal and professional development - Awareness of Self and how others see us, areas for improvement, awareness of Learning Style, awareness of Professional Role, reflective and problem solving practice, Continuous Professional Development Teaching Learning Method • Lecture • Group discussion • Handout • Group activity • Individual Practice
4	T- 6	State ethical considerations which they need to consider as P&O	Ethics and the code of conduct Teaching Learning Method • Lecture • Group discussion • Case presentation
5	T- 3	Students will develop the skills of training and facilitating learning in people with disabilities and their families, as well as training of CBR workers and other members of the community	Training Skills – definition of training skills, need of training skills, different training methods, different approach of training Teaching Learning Method • Lecture • Group discussion • Group presentation

6	T- 3	Describe the importance of leadership in groups	Leadership –Functions of leader, qualities of a good leader Teaching Learning Method • Lecture • Group presentation
----------	------	---	---

THIRD YEAR

BPO/301 COMPUTER SCIENCE & GRAPHICAL COMMUNICATION

Time : 60 hours of theory

Course description:

Student will acquire computer knowledge to design the prosthetics and orthotics components and apply in research and development in prosthetics and orthotics field.

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

- Describe the advanced application of computer in prosthetics and orthotics field.
- Design various components for prosthetics and orthotics use.
- Make use of computer knowledge in the statistics data analysis and documentation.
- Describe the principles of computer aided design(CAD) & computer aided manufacture(CAM)

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 6	► Explain and able to do the dimension on technical drawing	Dimension on technical drawing, indication of linear and angular tolerance, methods of dimensing and toleracing, cone methods of indicating surface texture on technical metal work
2	T- 6	► Able to draw projections	Orthographic projections, points, line and simple objects, Orthographic and isometric projection of P & O components
3	T- 3	► Describe about the computers and components	Introduction to computers and Components of computers: Physical Composition, Central Processing Unit, Main Memory, Input and Output units and also all kinds of common types of computer peripherals. Teaching learning Method • Lecture discussion • Computer
4	T- 2	► Describe about the Hardware.	Hardware: Various Configurations, Specification of peripherals and computer system. Various types of storage facilities and its advantages and disadvantages.

			Teaching learning Method - Lecture discussion - Computer
5	T- 3	Describe the computing environments	Computing environments: Introduction to types of computers- Personal computers, Main frame and super computers, Networks, E-Mail, Internet. Introduction to operating systems, e.g. DOS, Windows, Linux, Unix, commands and introduction to General file systems. Teaching learning Method - Lecture discussion - Computer
6	T- 2	Describe about the software	Software: The current operating software's, Word Processor, spreadsheet, database and presentation software, e.g. Windows XP or Windows 2000 Professional, Microsoft Office XP or 2000 Professional etc., upgraded as used currently, Anti Virus. Teaching learning Method - Lecture discussion - Computer
7	T- 6	Understand basic of engineering drawing	Basic Engineering Drawing
Computer Aided Design & Manufacturing (CAD & CAM)			
8	T-6	Describe the basic of CAD.	Basics of CAD: Introduction, Definition, History, Current status, Product Cycle, Automation, Designing, Application and Benefits. Teaching learning Method - Lecture discussion - Computer
9	T-6	Describe computer graphics	Computer Graphics: Introduction of software, Function of graphic package, Application Software Teaching learning Method - Lecture discussion - Computer
10	T-6	Describe the Auto CAD 2002	Auto Cad updated version: Introduction, Foundation of Auto Cad Commands, Execution of Simple 2D Drawings,

			Understanding 3D commands, Executing 3D Commands, Creating 3D objects. Rendering and Image attach to an object Starting New Projects, Creating, Editing, Saving Drawing, Annotation, Dimension, Plotting, Customization, Auto Lisp. Teaching learning Method • Lecture discussion • Computer
11	T- 2	► Describe CNC	Introduction to CNC, History of CNC, Advantages and disadvantages of N/C, CNC, DNC, Major part of CNC. Teaching learning Method • Lecture discussion • Computer
12	T-6	► Describe the basics of CAM	Basics of CAM: Introduction of CNC machine, basics of Computer Aided Designing and Manufacturing (CAD/CAM) and its use in P&O. Other kinds of Computer use in Prosthetics and Orthotics. CAD/CAM Technology in socket making and also making of different kinds of orthosis and prosthesis. Teaching learning Method • Lecture discussion • Computer
13	T-6	► Describe in detail about using CAD/CAM in fabrication of prosthesis and orthosis.	CAD/CAM in Prosthetics & Orthotics: types of digitizers used, concept of different types of modifying software, CNC carver and its specification, step wise fabrication procedure of sockets, shells and spinal orthoses, its advantages and disadvantages Teaching learning Method • Lecture discussion • Computer

BPO/302 BIOMECHANICS-III**Time** : 60 hours of theory**Course description:**

The understanding of bio-mechanical principles of prosthetics, orthotics and spine will be the foundation of the work of the students. It is essential to have a sound theoretical knowledge of the subject and students are able to demonstrate the rigorous application of these principles to practical P&O situations and in the analysis of those situations.

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

- Demonstrate the ability to apply principles of upper and spinal biomechanics to explain the principles of P&O treatment, (involving various force systems) and the practical problems encountered in Prosthetics and Orthotics.
- Understand the basics concept of control systems and its application in external powered orthosis and prosthesis
- Analyse the principles of design concept to explain its usage in Prosthetics and Orthotics.
- Apply biomechanical principles to generate optimal solutions to clinical problems in problems in Prosthetics and Orthotics.
- Understand the concepts of differentiation and integration and evaluate derivatives and integrals of a function.
- Able to analyse design calculations for P & O devices.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 9	▶ Describe biomechanics of upper limb	Biomechanics of Hand, wrist complex, elbow complex & shoulder complex. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
2	T- 9	▶ Describe hand function and augmentation ▶ Explain upper limb prosthetic socket and orthotic biomechanics ▶ Describe application of external sources	Upper Limb: Grasp patterns, grasp forces, mechanical replacement of hand function, augmentation of deficient hand function, upper limb prosthetic socket biomechanics- all types, Orthosis biomechanics, Application of external power, myoelectric control of external power and usage of devices. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids

3	T- 9	▶ Understanding of control systems	Control systems: Introduction to control theory. Application in Prosthetics and Orthotics of functional electrical stimulation (FES), hybrid orthosis, myoelectrics and bio-feedback. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
4	T- 12	▶ Explain biomechanics of spine ▶ Explain biomechanics different spinal orthosis	Spinal Biomechanics: Motions of the spine, Biomechanics of different region in spinal column, Biomechanics Inter vertebral disk, Lumbar Spine loading during normal activities and effects of Orthosis on this loads, Biomechanical Principles of spinal orthosis, Biomechanics of Corsets, Cervical/ thoraco/lumbar/sacral spinal orthosis. Biomechanics of scoliosis correction using different technologies and especially using Spinal orthosis. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
5	T- 6	▶ Explain concept of design in normal human body and its application in orthosis and prosthesis	Design concept part-I: Buckling, theories in failure/fatigue/ stress concentrations, connections, fluid mechanics and beam deflection. Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
6	T- 12	▶ Explain concept of design in orthosis and prosthesis	Design concept part-II: Shear force and bending moment diagrams, centroids, 2nd moment of area and mass, theorem of parallel axes, bending stress, torsional stress of circular shafts, combined axial and bending stresses. Combined and torsional stresses, combined axial bending torsional stresses. Open and closed helical springs, beam deflection. Design test standards/materials/Philadelphia Loads/ISO. Design calculations for P&O devices.

			Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids
7	T- 3	► Explain spinal biomechanical principles	Different ways of design tests, use of FES and myoelectric control system in P&O devices. Column of the spine, biomechanics of spinal injuries, follower load, Euler's theory of buckling Teaching learning Method • Lecture discussion • Group discussion/ activity • AV aids

BPO/303 ASSISTIVE TECHNOLOGY

Time : 70 hours of theory
80 hours of Practical

Course description:

Students would learn about the use of various types of mobility aids required by PWDs and related analysis of the gait pattern.

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

- Explain the prescription of commonly used mobility aids like crutches, walking stick, and walkers.
- Assess and prescribe the best possible mobility solution for a wheelchair user
- Carry out repair and maintenance of wheelchair
- Describe the correct use of the wheelchairs, transfers and various modifications of wheel chairs
- Train users to make the best use of their wheelchair.
- Assess, prescribe and fabricate different types of developmental aids
- Describe the analysis of gait with the related mobility aids.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-13 P-18	► Able to identify the types and explain the prescription criteria ► Able to explain the fabrication method of axillary elbow crutch. ► Able to take the measurements for all the mobility and walking devices.	Mobility and Walking aids: Canes, walking sticks, Crutches - auxiliary, elbow and forearm support. Different types of Walking Frame, Walker and their attachments. Para podium etc Teaching learning Method • Lecture discussion • Explain using charts

2	T-16 p-12	► Able to explain the biomechanics of developmental aids. At the same time they should be equipped enough to fabricate and fit all kinds of developmental aids by using local resources.	Developmental aids: Biomechanics of various kinds of developmental aids, Normal milestone and delayed milestone, prescription, design and materials used, measurement techniques, fabrication of Box seat, Special Chair with or without table/tray, Standing/ tilting frame, Low-level cart, Prone board and various developmental and educational toys. Maximum use of Appropriate Technology while making developmental aids. Teaching learning Method • Lecture discussion • Explain using charts • Computer • Group activities
3	T-12	► Able to explain the biomechanics of the molded seat and describe the prescription, fabrication & fitting technique of molded seats with proper suspension.	Molded seats: Biomechanics of various kinds of molded seats, prescription criteria, cast and measurement techniques, Cast modifications, fabrication of molded seats with inside or outside posting, use of different materials and technologies to fabricate the same, suspension or right kinds of strapping. Teaching learning Method • Lecture discussion • Explain using charts
4	T-18 P-38	► Students will be able to describe the advantage and disadvantage of each type of wheelchair. ► They should be able to assess, Prescribe, fit, modify and educate the user about the wheelchair. ► Student will be able to carry out basic care and maintenance of manual wheelchair ► Students will; be able to fabricate different type of cushion.	Wheelchair: Manual wheelchair: Benefits of appropriate wheelchair for a wheelchair user, Features and benefits of 'sitting upright' in wheelchair, Types of wheelchair, cushion and its components and its safe handling, pressure relief techniques, user assessment, prescription, measurement, fitting, Transfer techniques, Wheelchair mobility skills, Customized wheelchair, Care & Maintenance of Wheelchairs and importance of wheelchair user instructions. Cushions and its fabrication technique & wheelchair modification. Other types: Introduction: Motorized wheelchair, tricycle and motorized tricycle, modified two wheeler for mobility. Robotics

			Arms. Teaching learning Method - Lecture discussion - Explain using charts
5	T-5 T-6	- Students will be able to explain and demonstrate different types of gait with crutches. - He/she should be able to explain the parallel bar fabrication and transfer the user from parallel bar to walker and walker to crutches.	Gait Training with various walking aids, Installation/ fabrication of Parallel bars. Teaching learning Method - Lecture discussion - Live models
6	T-6 P-6	Students should be able to design and fabricate the suitable gadgets to assist in ADL.	Self-help devices: Special gadgets to assist in activities of daily living (A.D.L.) – assistive device for SCI patients, stroke patients etc. Teaching learning Method - Lecture discussion - Explain using charts

BPO/304 RESEARCH METHODOLOGY & BIOSTATISTICS

Time : 60 hours of theory

Course description

The student would acquire the knowledge of the research problem, design, Sampling, data collection, analysis of data, Testing hypotheses, interpretation and report writing to prosthetics and Orthotics

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

- Explain the process, types, design, needs, principles of research
- Formulate an appropriate research plan in order to solve a clinical problem
- Examine the concepts of estimation and hypothesis testing with applications to population proportions, means, variances
- Describe the sampling, data collection and processing of data
- Examine the data by using different measures
- Perform effective descriptive statistical analysis as well as statistical inference for a variety of mainstream applications

- Use appropriate empirical and probability distributions to model data.
- Conduct a basic research study in order to solve a clinical problem

Unit	Time (Hrs)	Specific Learning Objectives	Content and Teaching learning Method
1	T- 18	► To perform effective collection of data and presentation of data	Introduction to Biostatistics 1. Definition – Statistics, Biostatistics 2. Applications of Biostatistics 3. Data collection from experiments & surveys. 4. Variable – Qualitative & Quantitative, Discrete and continuous. 5. Presentation of Data: - a) Tabular Presentation of Data – Statistical Table, Format of a Table. b) Frequency Distribution – construction of Frequency Distribution, cumulative and relative frequency distribution, Exclusive and inclusive method of classification of Data. c) Diagrammatic Presentation of Data: Bar diagrams, Pie Diagram, Line Diagram, pictogram, Cartogram or Statistical map. d) Graphical representation of a Frequency distribution – Histogram, Frequency Polygon, Frequency curve, ogives or cumulative frequency curves Teaching learning Method • Lecture discussion • Explain using charts • Numerical examples
2	T-6	► Explain the meaning of research& its types	Research methodology: Introduction to Research methodology: Meaning of research, objectives of research, Types of research & research approaches, Teaching learning Method • Lecture discussion • Explain using charts • Numerical examples • Research articles
3	T-6	► Describe the necessity of describing a research problem,	1.Research problem: Statement of research problem Statement of purpose and objectives of research problem, Necessity of defining the problem Teaching learning Method • Lecture discussion • Explain using charts

			- Numerical examples - Research articles
4	T-3	► Explain what is research design	2. Research design: Meaning of research design, Need for research design, Teaching learning Method - Lecture discussion - Explain using charts - Numerical examples - Research articles
5	T-2	► Describe the sampling procedure	4. Sampling Design: Criteria for selecting sampling procedure Teaching learning Method - Lecture discussion - Explain using charts - Numerical examples - Research articles
6	T-5	► Explain the measurement and scaling technique	5. Measurement & scaling techniques: Measurement in research- Measurement scales, sources of error in measurement, Teaching learning Method - Lecture discussion - Explain using charts - Numerical examples - Research articles
7	T-5	► Describe the different data collection methods	6. Methods of data collection: collection of primary data. Teaching learning Method - Lecture discussion - Explain using charts - Numerical examples - Research articles
8	T-5	► Explain the need for sampling	7. Sampling fundamentals, need for sampling Teaching learning Method - Lecture discussion - Explain using charts - Numerical examples - Research articles
9	T-5	► Describe the procedure to do analysis of data	8. Analysis of data: Types of analysis. Teaching learning Method - Lecture discussion - Explain using charts - Numerical examples - Research articles

10	T-5	► Explain the concepts of hypothesis with its applications	9. Testing of hypothesis: What is hypothesis? Basic concepts concerning testing of Hypothesis Teaching learning Method • Lecture discussion • Explain using charts • Numerical examples • Research articles
----	-----	--	--

BPO/305 PROSTHETIC SCIENCE-III

Time : 80 hours of theory

Course Description:

This subject is delivered in a coordinated manner with the Practical part of the 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.

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

- 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 prosthetic solutions including, aetiology, clinical presentation, prognosis and appropriate device management.
- Demonstrate empathy between Prosthetics 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 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 components.
- Formulate appropriate prosthetic and orthotic prescriptions for wide range clinical situations.
- Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the Prosthetist.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 5	- Describe the normal function of hand. - Describe the mechanical component use in Upper limb prosthetics.	Upper Limb: Grasp patterns, grasp forces, mechanical replacement of hand function, augmentation of deficient hand function, upper limb prosthetic socket biomechanics – all types. Teaching learning Method - Lecture discussion - Explain using charts - Models
2	T-9	Describe the control mechanism	Control systems: Introduction to control theory, application in Prosthetics of functional electrical stimulation (FES), myoelectric and bio-feedback. Teaching learning Method - Lecture discussion - Models
3	T-3	Describe the prosthesis, and its history.	Upper limb prosthetics: Historical development in Upper Limb Prostheses – India and abroad, Upper Extremity Prosthetics Components - Terminal devices, Wrist units, Elbow units, Shoulder units, Harnessing systems in Upper extremity prosthesis. Teaching learning Method - Lecture discussion - Models
4	T-9	Describe the passive, cosmetics and functional prosthesis for partial hand.	Partial Hand: Passive, cosmetics and functional types which also includes silicon prostheses. Cosmetic hand gloves and fingers. Devices for augmentation of function and cosmesis for partial hand amputation and finger amputation. Teaching learning Method - Lecture discussion - Models
5	T-12	Describe the indications and prescription criteria and prescription for Wrist	Wrist Disarticulation: Prescription Criteria, Types of prosthesis – Components, Socket Shape, Clinical Considerations, Casting and measurement techniques, Cast modifications, Fabrication techniques, alignment techniques, Harnessing and suspension mechanisms, Fitting, donning and

		Disarticulation prostheses ▶ To be able to fabricate, take trial and check out of prosthesis	doffing techniques. Check out procedures, Testing and Training. Teaching learning Method • Lecture discussion • Models
6	T-12	▶ Describe the indications and prescription criteria and prescription for Below Elbow prostheses ▶ To be able to fabricate, take trial and check out of prosthesis	Trans Radial: Prescription Criteria, Types of Trans Radial prosthesis – Components, Types of Socket which includes Self suspending, flexible/rigid socket or combination of both, Clinical Considerations, Casting and measurement techniques, Cast modifications, Fabrication techniques – single wall and double wall, alignment techniques, Harnessing and suspension mechanisms, Control system – body powered and externally powered, Fitting, donning and doffing techniques. Check out procedures, Testing and Training. Teaching learning Method • Lecture discussion • Models
7	T-15	▶ Describe the indications and prescription criteria and prescription for Above Elbow prostheses ▶ To be able to fabricate, take trial and check out of prosthesis	Trans Humerus: Prescription Criteria, Types of Trans Humeral prosthesis which also includes Elbow Disarticulation prostheses – Components, Different types of Elbow Mechanisms. Types of Socket which includes Self suspending, flexible/rigid socket or combination of both, Clinical Considerations, Casting and measurement techniques, Cast modifications, Fabrication techniques – single wall and double wall, alignment techniques, Harnessing and suspension mechanisms, Control system – body powered and externally powered, Fitting, donning and doffing techniques. Check out procedures, Testing and Training. Teaching learning Method • Lecture discussion • Models
8	T-15	▶ Describe the indications and prescription criteria and	Shoulder Disarticulation: Prescription Criteria, Types of prosthesis both cosmetics and functional, Components, Different types of Elbow and Shoulder Mechanisms. Types of Socket, Clinical Considerations, Casting and

		prescription for Shoulder disarticulation prostheses ▶ To be able to fabricate, take trial and check out of prosthesis	measurement techniques, Cast modifications, Fabrication techniques, alignment techniques, Harnessing and suspension mechanisms, Control system – body powered and externally powered, Fitting, donning and doffing techniques. Check out procedures, Testing and Training. Teaching learning Method ◦ Lecture discussion ◦ Models
--	--	--	---

BPO/306 ORTHOTIC SCIENCE -III

Time : 80 hours of theory

Course Description:

The student will be required to acquire and comprehend the necessary theoretical knowledge and to be able to integrate this effectively in clinical practice.

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

- 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 solutions including, aetiology, clinical presentation, prognosis and appropriate device management.
- Demonstrate empathy between Orthotic 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 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 orthotic components.
- Formulate appropriate orthotic prescriptions for wide range clinical situations.
- Understand and describe the roles of key members of the rehabilitation team and identify how they interrelate with the orthotist.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-9	Describe the control mechanism	Control systems: Introduction to control theory, application of Functional Electrical Stimulation (FES) in Orthotics, hybrid Orthosis. Teaching learning Method - Lecture discussion - Models
2	T-33	Describe the upper limb orthosis, its indication, parts, designs & functions.	Upper Limb Orthotics: Objectives of splinting and principles. Types & classification of Orthoses. Biomechanical principal of all types of upper limb Orthotics. Material used and its advantages and disadvantages. All types of Hand Orthoses, Wrist Hand Orthoses, Elbow Orthoses, Shoulder Elbow Wrist Hand Orthoses & Pelvic Shoulder Elbow Wrist Hand Orthosis. Measurement/casting and Fabrication of P.S.E.W.H.O, S.E.W.H.O, Elbow Orthoses, Elbow Wrist and Hand Orthoses, Elbow braces etc. Teaching learning Method - Lecture discussion - Explain using charts - Models
3	T - 6	Describe orthotic management of rheumatic arthritis and burns	Orthotic management of rheumatic arthritis and burns etc Teaching learning Method - Lecture discussion - Explain using charts - Models
4	T-26	- Describe the shoulder elbow orthosis (SEO), shoulder elbow wrist hand orthosis (SEWHO), Elbow orthosis (EO) for various conditions. - Describe about the temporary splinting,	Immobilization/ mobilization, Appliances for flail elbows: Measurement/casting and Fabrication of Shoulder Orthoses, The shoulder joint braces and splints, Abduction splints and braces, Traction splint of Humerus, All types of Shoulder Elbow Wrist and Hand Orthoses which also includes both body powered and externally powered. All types of fracture Orthoses, Temporary splinting, Feeder and other assistive appliances. Teaching learning Method - Lecture discussion - Explain using charts - Models

		fracture orthosis, & other supportive devices.	
5	T - 6	Describe the control mechanism	Upper Limb: Orthosis biomechanics, application of external power, myoelectric control of external power and usage of devices. Teaching learning Method • Lecture discussion • Explain using charts • Models

BPO/351 PRACTICAL PROSTHETIC SCIENCE-III

Time : 320 hours of practical

Course Description:

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.

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

- Assess the medical condition of a patient related to their orthotic or prosthetic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal prosthetic 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 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.
- 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 trim lines.
- Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
- Assess and solve 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P - 302	► To be able to fabricate, take trial and check out of prosthesis	Prosthetics Practical: Fabrication of prosthesis for partial hand amputation or congenital absence, through wrist prosthesis, Below Elbow prosthesis, Above Elbow prosthesis, Shoulder Disarticulation prosthesis, Elbow Disarticulation prosthesis – preferably using various available technologies. Teaching learning Method • Demonstration • Practice sessions • Models
10	P - 18	► To be able to fabricate different design of prosthesis.	Practical: Different ways of design test, use of FES and myoelectric control system in P&O devices. Teaching learning Method • Lecture discussion • Demonstration

BPO/352 PRACTICAL ORTHOTIC SCIENCE -III

Time : 320 hours of practical

Course Description:

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.

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

- Assess the medical condition of a patient related to their orthotic management using appropriate investigative techniques which include patient history taking and clinical testing.
- Formulate an optimal orthotic 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 trim lines.
- Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate correction.
- Assess and solve orthotic problems as part of long term patient care.
- Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
- 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P-320	▶ To be able to fabricate different design of prosthesis.	Practical: Fabrication of at least 5 types of splints belonging to each group on model/mannequins Teaching learning Method • Lecture discussion • Models • Demonstration • Practice sessions • Patterns for fabrication

BPO/353 PRACTICAL COMPUTER SCIENCE

Time : 90 hours of practical

Course description:

Student will acquire computer knowledge to design the prosthetics and orthotics components and apply in research and development in prosthetics and orthotics field.

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

- Describe the advanced application of computer in prosthetics and orthotics field.
- Design various components for prosthetics and orthotics use.
- Make use of computer knowledge in the statistics data analysis and documentation.
- Demonstrate the use of all branches of MS office, drawing and imaging software, computer aided design(CAD) & computer aided manufacture(CAM)

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P-90	▶ Able to operate the MS office, word and power point in details. ▶ Describe about the through in all branches of CADCAM & AUTOCAD	Practical: 1. Students has to be thorough in all branches of MS Office especially WORD and POWERPOINT. In addition to that it would be better if Student also learn one additional drawing and imaging software among e.g. Corel Draw, PageMaker, Photoshop or similar kind of softwares. 2. Student has to be thorough in all branches CADCAM especially AUTOCAD. Student should make design of all common types of P&O components which are regularly in use by using AutoCAD software. Teaching learning Method • Lecture discussion • Explain using charts • Computer

FOURTH YEAR

BPO/401 PROSTHETIC SCIENCE IV

Time : 60 hours of theory

Course Description:

The course is designed to enable students to acquire knowledge of Hip disarticulation, Bilateral stubbies, Translumbal, child and congenital for the fabrication of prosthesis

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T - 30	▶ Describe the indications and prescription criteria for Hip Disarticulation prostheses ▶ Able to describe the measurement, casting, fabrication, trial and check out of Hip disarticulation prosthesis. ▶ Able to describe the components of Hip disarticulation prosthesis and their functions.	Hip Disarticulation Prosthesis: Various types of through hip Prosthesis. Prescription principles, Materials and components to be used, Casting and measurement techniques, Cast modification, alignment, suspension, Fitting, donning and doffing techniques. Check out procedures, Testing and Training. Through hip Gait analysis and deviations. Teaching learning method: • Lecture discussion • Charts & Models • Case presentation
2	T-30	▶ Able to explain the fabrication, trial and check out procedures of critical prosthesis ▶ Able to prescribe and fabricate adaptive devices for amputee.	Prosthetics: Bilateral Stubbies. Bilateral Prosthesis. Trans Lumber Prosthesis (Sitting and Standing), Prosthesis for Child Amputee, Prosthesis for Congenital anomalies, Prosthesis adaptation for sports and recreation, Immediate post surgical fittings, Check-out Procedures. Teaching learning method: • Lecture discussion • Charts & Models • Case presentation • Seminar

BPO/402 ORTHOTIC SCIENCE -IV**Time** : 80 hours of theory**Course Description:**

The course is designed to enable students to acquire knowledge of spinal brace, its history, principal and different design for fabrication of spinal orthosis. They also get to know special type of orthosis.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T- 15	▶ To understand the principle behind fabrication of spinal orthoses & ▶ To understand the functions of spinal brace.	Spinal Orthoses: Historical development of spinal orthoses. Anatomical and Physiological Principles of construction and fitting of spinal Orthoses. Biomechanical principle and Functions of spinal Orthoses. Indications and Contraindications for spinal orthosis. Teaching learning method: • Lecture discussion • Charts & models
2	T- 6	▶ To know the principle, types & fabrication of cervical orthoses.	Cervical Orthoses: Principle, material, measurement/ casting, fabrication of all types of Cervical Orthoses especially different types of cervical collar, semi-rigid/rigid cervical orthoses both temporary and permanent. Cervical Traction, HALO traction and various types. Teaching learning method: • Lecture discussion • Charts & models
3	T-59	▶ Able to understand the principle, types & fabrication of TLSO orthoses and fitting techniques. ▶ Able to understand the principle & fabrication of LSO orthoses and fitting techniques. ▶ Able to understand the	Thoraco lumbo Sacral Orthoses: Flexible spinal Orthoses. Rigid spinal orthoses. Principle, material, measurement/ casting, fabrication of all types of Thoraco Lumbo sacral orthoses (TLSO) especially all types of orthoses for scoliosis & kyphosis. All types of under arm orthoses and variants. Various types of Immobilisers, Fitting, donning and doffing techniques. Check out procedures, Testing and Training. Lumbo sacral Orthoses: Principle, material, measurement/ casting, fabrication of all types of Lumbo sacral orthoses (LSO) especially Corsets and all types of orthoses for Lordosis and scoliosis. Pelvic traction and its uses.

		principle & fabrication of cranial orthosis. ▶ Demonstrate the orthotic management of spinal deformities and Pott's spine	Cranial Orthoses. Orthotic management of spinal deformities/injuries. Orthotic management of Pott's spine. Teaching learning method: • Lecture discussion • Charts & models • Assignment
--	--	--	--

BPO/403 MANAGEMENT & ADMINISTRATION

Time : 80 hours of theory

Course description:

Students would have an understanding of the planning, construction, human management, store management and safety of the workshop

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

- Explain techniques related to the design, planning, control and improvement of service and manufacturing operations.
- Demonstrate basic knowledge of financial 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.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	T-18	▶ Students should be able to explain the principles and definition of administration and management.	Introduction: Principles of Administrative and Management structure, Industrial Management, Definition of Organization. Principles of good organization, type of organizational setup Workshop Administration and management. Teaching learning Method • Lecture discussion • Explain using charts
2	T- 9	▶ Students will be equipped in doing man management.	Management: Introduction, Discipline, Security, distribution of work, Work sheet, Time sheet and staff Welfare.

			Teaching learning Method - Lecture discussion - Explain using charts
	T-17	► Students should be able to manage the day to day activities of the workshop.	Material Management: → Store and store organization. Inventory Control. Purchase organization. Introduction to cost accounting. Use of computer for effective store management. Teaching learning Method - Lecture discussion - Explain using charts
4	T-6	► Students will have the clear understanding of the safety of the manpower, machineries & tools.	Safety: Industrial accidents, safety and hazards Teaching learning Method - Lecture discussion - Explain using charts
5	T-12	► Students will be able to layout of the workshop and to manage day to day activities in terms of casting, billing, and documentation etc. ► Able to understand Leadership	Planning: Planning of Prosthetics and Orthotics Department at various levels, all types of various scales. Layout, plant Layout. Costing, billing, documentation especially development of recording system to manage individual's records. <u>Leadership.</u> Teaching learning Method - Lecture discussion - Explain using charts
6	T-3	► Able to understand waste management in hospitals for hygiene, & role of the international health agencies.	Human resource management & Environmental Science: Hospital waste disposal. Role of the International Health Agencies
7	T-6	► Able to do budgeting ► Able to implement quality insurance system ► Maintained ethical behavior during treatment of patient.	Economics: <i>finance</i> Business management practices such as cost calculations, accounting process and budgeting address issues related to clinic management including, appointment systems and record keeping, Quality control and the use of quality assurance system. (Appropriate code of ethical behaviour of P & O Professionals) - <i>follow the curriculum</i> Teaching learning Method - Lecture discussion - Explain using charts

*cost calculation
accounting process
Budgeting*

Clinic management

*appointment system
Record keeping
Quality Control*

Quality assurance system

8	T - 9	▶ Explain administration and its application in P & O. ▶ Describe rules of Professional Conduct	Introduction of administration, Nature and scope of administration, How to be an effective administrator, Principles of administration and its applications to Prosthetics and orthotics setup. Rules of Professional Conduct. Teaching learning Method • Lecture discussion • Explain using charts
---	-------	--	---

BPO/451 PRACTICAL PROSTHETIC SCIENCE IV

Time : 160 hours of practical

Course Description:

The course is designed to enable students to acquire the practical skills to fabricate the prosthesis for Hip disarticulation amputee, double or multiple amputees, congenital anomalies.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P - 160	▶ Able to fabricate prostheses for Hip disarticulation, multiple amputees, Burn injury and contracture.	Practical: Fabrication of Prosthesis for through hip, double or multiple amputees on model/mannequins, Fitting of Prosthesis in cases and developing and/or adapting new designs. Teaching learning method: • Case presentation • Seminar • Models/mannequins

BPO/452 ORTHOTIC SCIENCE -IV

Time : 160 hours of practical

Course Description:

The course is designed to enable students to acquire the practical skills to fabricate different design of spinal braces.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
5	P-160	▶ Able to fabricate all orthoses on model/mannequins	Fabrication of all types of orthoses on model/mannequins Teaching learning method: • Lecture discussion

			• Charts & models • Assignment • Model/mannequins
--	--	--	---

BPO/453 PROSTHETICS CLINICAL PRACTICE

Time : 250 hours of practical

Course description:

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 student will develop skills in the:

- Communication
- Assessment and prescription;
- Manufacture of prostheses and orthoses;
- Clinical provision of prostheses and orthoses;
- Interpersonal relationships;
- Organisation and management;
- Clinical research.
- Contributing too and learning from the clinic team.

Unit	Time (Hrs)	Specific Learning Objectives	Content and Teaching learning Method
1	P - 250	▶ Demonstrate the communication process and self-assess to reflect on their own communication skills. ▶ Assess and prescribe the prosthesis by direct involvement of patient. ▶ Fabricate prosthesis from assessment to delivery. ▶ Perform store management and local purchasing. ▶ Record individual rehabilitation plan document and perform case presentation in	Direct Service: In this period each trainee will be in touch directly with the persons with disabilities under supervision of the Instructor/Demonstrator. She/he would do all the necessary work from start to the finish for fittings of suitable prostheses. Each person fitted with prostheses has to be documented/ recorded well and to be presented in the clinics in front of health care team and other trainees. Besides fitting, trainee would also work with other rehabilitation team members to understand "Total Rehabilitation". Teaching learning method: • Case presentation • Clinical meeting

		clinical meeting and seminar. ▶ Interact and work in collaboration with other professionals to understand total rehabilitation.	
--	--	--	--

BPO/454 ORTHOTICS CLINICAL PRACTICE

Time : 250 hours of practical

Course description:

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 student will develop skills in the:

- Communication
- Assessment and prescription;
- Manufacture of prostheses and orthoses
- Clinical provision of prostheses and orthoses
- Interpersonal relationships;
- Organisation and management;
- Clinical research.
- Contributing too and learning from the clinic team.

Unit	Time (Hrs)	Specific learning Objectives	Content and Teaching learning Method
1	P-250	▶ Demonstrate the communication process and self-assess to reflect on their own communication skills. ▶ Assess and prescribe the orthosis by direct involvement of patient. ▶ Fabricate orthosis from assessment to	Direct Service: In this period each trainee will be in touch directly with the persons with disabilities under supervision of the Instructor/Demonstrator. She/he would do all the necessary work from start to the finish for fittings of suitable prostheses. Each person fitted with prostheses has to be documented/ recorded well and to be presented in the clinics in front of health care team and other trainees. Besides fitting, trainee would also work with other rehabilitation team members to understand "Total Rehabilitation".

		delivery. ▶ Perform store management and local purchasing. ▶ Perform store management and local purchasing. ▶ Record individual rehabilitation plan document and perform case presentation in clinical meeting and seminar. ▶ Interact and work in collaboration with other professionals to understand total rehabilitation.	Teaching learning method: • Case presentation • Clinical meeting
--	--	---	--

BPO/455 PROJECT WORK

Time : 180 hours of practical

Course Description:

The course is designed to enable students to apply their clinical skill and research knowledge acquired during their study.

Unit	Time (Hrs)	Learning Objectives	Content and Teaching learning Method
1	P-180	Students will be able to reflect on their learning, do the documentation and to explore the creative skill which has been gained throughout study period.	Each Trainee shall take a project work under supervision of a guide. Project work has to be well documented and presented in essay form. The major focus will be trainee's original work which she or he has to present prior to final examination. The subject and the guide should be chosen within four weeks from the day of admission to the fourth year.

INTERNSHIP

1. Internship is compulsory.
2. Duration: 6 months
3. Eligibility: Internship will start immediately after the declaration of result of final year/ semester & candidate is declared pass in all four years / eight semesters
4. Structure and duration of the postings:
 - a) The place of postings of the students for internship will be decided by the respective institute conducting the course.
 - b) Students should spend minimum of 50% period of internship at parent institute and upto 50% period outside the parent institute like hospital set ups, educational set ups, special clinical facilities. Exposure should be for those areas where limited exposure was provided in the parent institute.
5. Mode of supervision during internship: Supervision should be provided by a Qualified Prosthetics and Orthotics Professional.
6. Maintenance of records by students: Every student should maintain records of the number of hours of clinical work in different areas and institutions. This should be certified by the head of the department/organisation/ institution or his/her nominee where the student is undergoing internship.
7. Extension of internship: Internship shall be extended by the number of days the student remains absent.
8. Stipend: As per the norms of the parent Institute.
9. Grading and evaluation of student: Grading and evaluation should be done by the institute where the candidate is doing internship. The student will be required to repeat those postings in which his/her performance is found unsatisfactory.
10. Certification: The parent institute/affiliating University will award a certificate after successful completion of the internship.
11. The University shall award the degree certificate only after the successful completion of the internship.

SECTION IV RECOMMENDED BOOKS & JOURNALS

ANATOMY

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Human Anatomy: Regional and Applied	Chaurasia, B D	CBS, New Delhi	2004 3V
2.	Human Osteology	Chaurasia, B D	CBS, New Delhi	1991
3.	Anatomy: Palpation and Surface Markings	Field, Derek	Butterworth, London	1997
4	Human Osteology	A.K. Dutta		
5.	Grant's Method of Anatomy	John V. Basmajian		
6	Gray's Anatomy for Students	Richard L. Drake, Wayne Vogl &		

PHYSIOLOGY

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Human Physiology	Chatterjee, C. C.	Medical Allied	1997 2V
2.	Human Physiology for B.D.S and PT/OT	Dr. A. K. Jain		1st Edition
3.	Text Book of Medical Physiology	Guyton, A.C. and Hall, J. E.	W. B. Saunders, Singapore	1998
4.	Essentials of Medical Physiology	K. Sembulingam & Prema		
5.	Concise Medical Physiology	Dr. Sujit Ku Choudhury	New center book agency, West	

WORKSHOP TECHNOLOGY & MATERIAL SCIENCE

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Material science & engineering	Calin, Andrea		6th ed.
2.	Physics of plastics	Biller, Jose		
3.	Carbon materials for advanced technologies	Bulson, P.S. ed		
4.	Fundamentals of polymer engineering	Ram, Arie		
5.	Plastics technology handbook	Chan, Karence K. ed.		2nd ed.

6.	Polymer Foams Handbook	Nigel Mills		
7.	Text book of Material Science & metallurgy	O. P. Khanna		
8.	Introduction to Composite materials	S. W. Tasi		
9.	Composite Materials	L. J. Broutman & R. H. Kroch		
10.	Material Science & Process	M. K. Murlidhar		
11.	Workshop Technology Vol. I & II	B.S. Raghuvanshi	Dhanpat Rai & Co. Delhi	
12.	Basics Mechanics Explained	John Lord & Ann Reed	Butter North, Oxford	
13.	Workshop Technology	Chapman		Vol. I, II & III

APPLIED MECHANICS & STRENGTH OF MATERIAL

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Applied Mechanics	R. S. Khurmi		
2.	Strength of Materials	Jagdish Lal		

BIOMECHANICS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Bio-mechanical basis of Orthotics Management	P. Bowker, D.N. Conde,	Butter worth-Heinemann Ltd.	
2.	Introduction to biomechanics	Humphrey, Jay D.		
3.	Biomechanical Basis of human movement	Hamill, Joseph		2 nd ed.
4.	Human walking	Rose, Jessicaed.		
5.	Kinesiology	Soderberg, L. ed.		
6.	Introduction of Kinesiology	Hoffoman shirt J. ed.		2 nd ed.
7.	Muscles, nerves & movement	Tyldesley, Barbara		3 rd ed.
8.	Gait analysis	Perry, Jacuelin		
9.	Human body dynamics	Tozeren, Aydin		
10.	Human motion analysis	Harries, G.F.ed		
11.	Clinical biomechanics	Dvir, Zeevi		

12.	Basic Biomechanics	Hall Susan J	McGraw-Hill	
13.	Gait disorders	Hausdorff, Alexander	B. I. Publications P	
14.	Fundamentals of Bio-Mechanics	Duane Knudson		2nd ed.
15.	Principles of mechanics and biomechanics	Stanley Bell P Frank	B. I. Publications UK	
16.	Clinical Biomechanics	Black Jonathan		
17.	Biomechanics of the Foot and Ankle	Donatelli, R.A.	Davis, Philadelphia	
18.	Physiology of Joints	Kapandgi, I.A.	Churchill-Livingstone	Vol. I,II & III
19.	Basic biomechanics of the musculoskeletal	Margareta nordin	Lippincott Williams &	
20.	Clinical gait analysis	Chris Kirtley	Elsevier Churchill	
21.	Clinical biomechanics of the lower extrimity	Ronald L Valmassy	Mosbay	

BASIC ELECTRONICS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Basic electronics	Thereja, B.L.		
2.	Sensor technology hand book	C.D.		
3.	Fundamentals of digital electronics & microprocessors	Singh, Anokh		
4.	Biological & Medical Electronics	Ralph. W. Stach, Ph.D.	London.	
5.	Bio-electricity	by E. E. Svek / Ling D.E.E.		

PROSTHETICS & ORTHOTICS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Prosthetics & Orthotics	Shurr. G. Donald & J.W.Michel		2nd ed.
2.	Prosthetics & Orthotics Lower Limb & Spine	Seymour, Ron		
3.	Amputations & Prosthetics	May Bella J.	Jaypee Publisher New Delhi	
4.	Orthotics in functional rehabilitation of the lower limb	Nowoczenski, Deborah A.		

5.	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	American Academy of Orthopaedic Surgeons	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	
6.	Orthotics	Edestein, Joan E.	Jaypee Publisher New Delhi	
7.	Orthotics in rehabilitation	Mckee, Pat		
8.	Hydraulics and pneumatics	Parr, Andrew		
9.	Foot and ankle in sports	Bates, Andrea		
10.	Functional fracture bracing	Sarmiento, A.		
11.	AAOS atlas of Orthosis and assistive devices,	Hsu, John D.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	
12.	Maintenance and care of the prosthesis	C.A. Hannesseg		
13.	Manual for lower Extremity prosthetics Publisher : Mosby		Mosby publications / or N.Y.U. St. Louice, London, Chickago	
14.	Manual for Upper Extremity Prosthesis	William R.SANTASHI Edn		
15.	Hip disarticulation Prosthesis	C.A. Melancik		
16.	The Management of Spinal deformities	Kenton D. Leatherman Rober A. Dickson	Butter worth-Heinemann Ltd. Linacre House, Jordon Hill, Oxford OX2 BDP	
17.	Foot Orthosis	Kent, Wu		
18.	Principal in Prosthetic management for Multiple handicapped	E. F. Murphy		
19.	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	Jan Bruckner and Joan Edelstein		
20.	An Atlas of Lower Limb Orthotic Practice	D.N. Condie and S. Turner		

21.	Orthotics and Prosthetics in Rehabilitation	Michelle M. Lusardi PhD PT and Caroline C. Nielsen PhD		
22.	Guidelines for Prescribing Foot Orthotics	Mark A. Reiley		
23.	Orthotics in Functional Rehabilitation of the Lower Limb	Deborah A. Nawocze		
24.	Hand and Upper Extremity Splinting : principles and methods	Fess, Gettle, Philips Elaine Ewing, Karan S, Cynthia A	Elsevier Mosby St. Luis B. I. Publications P	
25.	Control of the Foot/Ankle Complex: Orthotic Recommendations	American Academy of Prosthetists & Orthotists	American Academy of Prosthetists & Orthotists	
26.	Orthology: Pathomechanics of Lower-Limb Orthotic Design	American Academy of Prosthetists & Orthotists		
27.	Powered upper limb prosthesis	American Academy of Prosthetist & Orthotist		
28.	Introduction to microprocessor	Mathur U. N. Dhur A. P	Mac-Graw Hill Inc. New Delhi	
29.	Orthotics Etcetera	John B Redford		
30.	Upper Extremity Orthotics	Anderson, Miles H.	Jaypee Publisher New Delhi	
31.	New Advances in Prosthetics and Orthotics	Mark H Bussell		
32.	Manual of Lower Extremity Orthotics	AAOS	Spring field	
33.	Prosthetic & patient management	Kevin Croll		1st
34.	Orthotic & Prosthetic management	Michel M. Lusardi		
35.	Clinical Practical & rehabilitation Technology	Johan B		
36.	The Immediate post-operative Prosthesis in	Andrew C. Ruoff & Others		

	L. E. Amputation			
37.	Congenital Limb Deficiency	Charles A Frank		
38.	Above Knee Amputation-Prosthetic Principles & Practice	Zems Grim		
39.	Hemipelvectomy Prosthesis	Fred Hampton		
40.	Hip Disarticulation Prosthesis	C. A. Mclaucik		
41.	Powered Lower Limb Orthotics in Paraplegia	J. Hughes		
42.	Bio-mechanical basis of Orthotics Management	P.Bowker, D.N. Conde D.L.Bader, D.J.PRATT	Butter worth-Heinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	

PATHOLOGY

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Basics of Pathology	By Robins		
2.	Test Book of Pathology	By Dr. Harsh Mohan	Jaypee Publisher New Delhi	

ORTHOPEDICS & AMPUTATION SURGERY AND IMAGING

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Outline of Orthopaedics	Adam's	Churchill livingstone	2001
2.	Apley's Systems of Orthopedics and Fracture	Solomon, Louis	Arnold, London	
3.	Essential Orthopedics	Maheshwari, J		
4.	Orthopedics: principles and their application	Terke, Samuel L.	Lippencott, New York	
5.	Amputation & Prosthesis	Miroslow Vitali		
6.	Essential Orthopedics and trauma	David J. Dandy	Churchill livingstone	
7.	Orthopedic physical assessment	David J. Magee	W. B. Saunders company	2002

PHYSIOTHERAPY/OCCUPATIONAL THERAPY

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Occupational Therapy	Pedartery		
2.	Occupational Therapy	Willard & Specsman		
3.	Hand Splinting	Win & Parry		
4.	Movement Therapy in hemiplegia	Brunn Stones		
5.	Introduction to Physical Therapy	Pagliarulo, M.A.	Mosby, London	
6.	Human Movement Explained	Jones,	Butterworth Heine	
7.	Principles of Exercise Therapy	Gardiner, Dena	CBS, New Delhi	
8.	Clayton's Electrotherapy: Theory and Practice	Froster, A. and Palastanga, N.	AITBS, Delhi	
9.	Electrotherapy Explained	Jhon, Low and A Reed	Butterworth Heine Oxford	
10.	Daniels and Worthingham's Muscle Testing: Techniques of Manual Examination	Hislop, H.J. and Montgomery, J.	W.B. Saunders Philadelphia	2002
11.	Tidy's Physiotherapy	Thomson, A	Varghese, Mumbai	
12.	Muscles Testing and Function	Kendal, F.P.	Lippi cott, New York	1993
13	Text Book of Preventive and Social Medicine	1 Park, J.E.	Banarsidas, Jabalpur	1987
14	Occupational Therapy: Practice skill	Pedretti, L.W.	Harcourt-Brace, New York	1990

COMMUNITY REHABILITATION & DISABILITY PREVENTION

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Physical Medicine & Rehabilitation	Bredamm, s		
2.	Physical Medicine & Rehabilitation	Deliza		
3.	Neurological Rehabilitation	Carr, J.H. and Shepherd, R.B	Butterworth, Oxford	
4.	Handbook of Physical Medicine and Rehabilitation	Kottke, F.J. and Lehman J.F.	W B Saunders, London	
5.	Tetraplegia and Paraplegia	Bromley, Ida	Churchill-Livingston,	

			London	
--	--	--	--------	--

PHARMACOLOGY

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Lippicott's Pharmacology			
2.	Essential of Medical Phramacology	By Tripathi		
3.	Text book of Medical Pharmacology	by Padmaja udaykumar		
4.	Pharmacology	by N.Muruges		
5.	Pharmacolgy & Pharmacotherapeutics	by Sadoskar		

PSYCHOLOGY & SOCIOLOGY

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Sociology	Vidya Bhusan & Mazumdar	Kitab Mahal New Delhi	
2.	Introduction to sociology	Devis		
3.	Child Development	By Hurlock (ED)		
4.	Intro. To Psychology ED.7	By Morgan (CT)	Tata Mcg. Hill, Delhi	
5.	Abnormal Psychology	BY Mohanty		
6.	Text Book of Sociology	Wallis, Willey Wilson D,Malcom M		

COMPUTER SCIENCE & GRAPHICAL COMMUNICATION

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	CAD, CAM	McMohan, Chris		
2.	CAD/CAM theory and practice	Zeid Ibrahim	B. I. Publications P New Delhi	
3.	Computer course	Satish Jain	Pub: BPB New Delhi	
4.	Computer Organisation & system Software	Satish Jain	Pub: BPB New Delhi	
6.	Computer graphics	Hammandlu	Pub: BPB New Delhi	
7.	Operating systems	BPB	Pub: BPB New Delhi	
8.	Auto CAD 2007 for engineers & designers	C.D		

9.	Sensor technology hand book	C.D		
----	-----------------------------	-----	--	--

RESEARCH METHADODOLOGY & BIOSTATISTICS

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Critical Moments in Quantitative Research	Armstrong H.B.	Butter worth-Heine Oxford	
2.	Orthotic system& research	R.M. Scot		

ASSISTIVE TECHNOLOGY

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Special seating An illustrated guide	Jean Anne Zollars, Male,PT	Prickly pear publication	2010/ Revised edition
2.	Fundamentals in Assistive technologies	Michellie.L. Lange, OTR, ABDA,ATP.	Rehabilitation engineering on Assistive technology society of north America	2008/4 th edition
3.	Spinal cord medicine	Steve krishblum M.D.	Lippncot Williams and Wilkins	2 nd edition/2002
4.	Getting to know cerebral palsy	Team of CBM project	LSHTM, London UK	2015/ original version
5.	Occupational therapy practice skills for physical dysfunction	Lorraine Williams pedrette, MS, OTR	Mosby/ Elsevier	4 th edition
6.	Assistive technology principles and practice	Cook and Hussey	Mosby/ Elsevier	3 rd edition
7.	Assistive technology assessment hand book	Stefano federici and Marcia.j. scherer	Taylor and francis	2012
8.	Occupational therapy for physical dysfunction	CatherineA. Trombly	Group LLC	5 th Edition

MANAGEMENT & ADMINISTRATION

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	Industrial Organisation and Engineering Economics	T.R.Banga and S.C.Sharma	Khanna Publishers	25th ed., 2015
2.	Production and operations management	S N Chary	Tata Mc Graw Hill	2nd ed., 2000
3.	Stores Management	K.S.Menon	Macmillan Publishers India Limited	2nd ed., 1996
4.	Essentials of Management	Harold Koontz, Heinz Weihrich	Tata Mc Graw Hill	8th ed., 2009

CONSITUTION OF INDIA

Sl. No.	Title	Author	Publisher	Year/Vol.
1.	The Constitution of India—A Politico-Legal Study	J.C. Joharii	Sterling Publication, Pvt. Ltd. New Delhi.	
2.	Constitution Law of India, Allahabad	J.N Pandey	Central Law Agency	1998
3.	The Indian Constitution—Corner Stone of a Nation—	Granville Austin	Oxford, New Delhi	2000

SECTION V

TEACHING FACULTY NORMS

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

1. STAFF REQUIREMENT:

Sl. No.	Core Faculty	Column-I 01-20 seats	Column-II 21-30 seats	Column-III 31-40 seats
1.	Professor & Head Department of Prosthetics & Orthotics	-	01	01
2.	Associate Professors (Prosthetics & Orthotics)	01	02	03
3.	Assistant Professor /Lecturer (Prosthetics & Orthotics)	03	04	06
4.	Prosthetist and Orthotist/Demonstrators (Prosthetic & Orthotic)	06	06	08

2. QUALIFICATION & EXPERIENCE OF THE CORE FACULTY

(Valid until revision of curriculum)

Sl. No.	DESIGNATION	QUALIFICATION & EXPERIENCE	PUBLICATION	PAY SCALE
1	Professor (Prosthetics & Orthotics)	Master in Prosthetics & Orthotics from an institution with a minimum of 10 years of teaching and research experience as Associate Professor (Prosthetic & Orthotic) Desirable: PhD in Prosthetics & Orthotics	Essential 05 publications	As per UGC norms
2	Associate Professor (Prosthetics & Orthotics)	Master in Prosthetics & Orthotics with 05 years of teaching experience as an Assistant Professor / Lecturer (Prosthetics & Orthotics) in any recognized Prosthetic & Orthotic Institution. Desirable: PhD in Prosthetics & Orthotics	Essential 03 publications	As per UGC norms
3	Assistant professor (Prosthetics & Orthotics)	Master in Prosthetics & Orthotics with 02 year experience in the field.		As per UGC norms
4	Prosthetist & Orthotist/ Demonstrator (P & O)	Master in Prosthetics & Orthotics or Bachelor in Prosthetics and Orthotics) with 02 year experience in the field		

NOTE:

1. These qualifications are applicable for future recruitment. The case of teachers who are already holding teaching posts and have more than 10 years teaching experience will continue to hold their post in their respective institution.
2. Existing experienced teachers having more than 10 years of teaching experience may be considered for promotion to Assistant Professor subject to fulfilment of essential qualification of Assistant Professor.
3. There shall be only three designations in respect of teachers in universities and colleges, namely, Assistant Professors, Associate Professors and professors.
4. The pay of teachers and equivalent positions in Technical institutions shall be fixed according to their designations in two pay bands of Rs. 15600-39100 and Rs. 37400-67000 with appropriate "Grade Pay".
5. The ratio of Professors to Associate Professors to Assistant Professors in a UG

College shall be in the ratio, ordinarily of 1:2:6. The ratio of Professors to Associate Professors or Assistant Professor in a PG College shall be in the ratio ordinarily of 1:2.

6. Minimum qualification for Assistant Professor should be Master in Prosthetics and Orthotics.
7. Assistant Professors possessing Master's degree in prosthetics and orthotics shall be eligible for the GP of Rs. 7600 after completion of 5 years' service as Assistant Professor i.e. to the rank of Associate Professor.
8. Assistant Professors with completed service of 5 years at the GP of Rs. 7600 shall be eligible to move up to the GP of Rs. 8700/.
9. Minimum of 2 teaching faculty members in core areas will be required for giving recognition for the first year.
10. Before the commencement of second academic year one more faculty member must be appointed.
11. In case of Professor not being available, 1 Readers/Associate Professors (additional) should be appointed to accommodate teaching, research guidance and administrative work.

3. GUEST/PART TIME FACULTY REQUIREMENTS FOR THE FOLLOWING DISCIPLINES

1. Anatomy
2. Physiology
3. Applied Mechanics & Strength of Material
4. Workshop technology & Material Science
5. Pathology
6. Orthopedics & Amputation Surgery & Imaging
7. Electro technology
8. Psychology and Sociology
9. Research Methodology & Bio Statistics
10. Computer science (CAD-CAM)
11. Management & Administration
12. Pharmacology

(Ministerial staff & others are not included)

SECTION VI

NORMS OF INFRASTRUCTURE

1. PHYSICAL FACILITIES:

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

Details of the constructed area given below are for the intake capacity up to 40 students:

S. No.	Name	Minimum Size in Sq. Ft.
1.	Class rooms (04 numbers)with audio-visual facility	04 @ 300 = 1200
2.	One room for clinical meeting	600
3.	Two trial fitting rooms (One for men & one for women)	02 @ 300 = 600
4.	Two measurement rooms (One for men & one for women)	02@ 200 = 400
5.	Prosthetic Lab	1050
6.	Orthotic Lab	1050
7.	Prosthetics & Orthotics faculty rooms (Minimum 06)	06 @ 100 = 600
8.	Two students common room (One for men & one for women)	1200
9.	One office room	150
10.	One course coordinator room	200
11.	Computer Laboratory room	600
12.	Two Machinery Room	500
13.	One store room	1350
14.	Gait training Laboratory	450
15.	One plaster room	400
16.	Waiting room for the patients	1350
17.	Adequate hostel facility	
18.	Reception & patient registration	400
19.	Common Multi-Purpose Hall (optional)	200
20.	One library room	

Note:

The space requirements mentioned above are for Prosthetic/Orthotic training only. It is presumed that the centre is having other facilities like Physiotherapy /Occupational Therapy and allied Departments for Rehabilitation.

Class rooms

There should be at least four classrooms with the capacity of accommodating the number of students admitted in each class. The rooms should be well ventilated/ thermo conditioning facility with proper lighting system. There should be built in LCD projector/White Boards.

Also there should be a desk/a big table and a chair for the teacher and Racks / Cup boards for keeping teaching aids or any other equipment needed for the conduct of classes.

Library

There should be a separate library in the Institute / College/ University. It should be easily accessible to the teaching faculty and the students, It should have comfortable seating arrangements for half of the total strength of the students and teachers in the school.

There should be separate budget for the library. The library committee should meet regularly for keeping the library updated with current books, journals and other literature. Internet facility should be provided in the library and to the faculty.

The library should have proper lighting facilities and it should be well-ventilated. It should have a cabin for librarian with intercom phone facility.

There should be sufficient number of cupboards, books shelves and racks with glass doors for proper and safe storage of books, magazines, journals, newspapers and other literature. There should be provision for catalogue-cabinets, racks for student's bags, book display racks, bulletin boards and stationery items like index cards, borrower's cards, labels, registers etc.

OFFICES REQUIREMENTS:

Coordinator Room

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

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

Record Room (Optional)

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

Other Facilities

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

Fire Extinguisher

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

Playground

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

Recreation

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

2. LIST OF TOOLS AND EQUIPMENT REQUIRED FOR THE BPO TRAINING:**i. LIST OF COMMON EQUIPMENTS**

Sl. No.	Name of Equipment	Minimum Requirement
1.	Hot Air Oven Heating chamber size- (36"W x 24"D x 30"H), with double layer toughened Front visible glass with inside light arrangement, Maximum temperature 350 Degree C. 12 KW Rating and 1HP 3 phase Motor for fan with Digital timer thermostat temperature Controller.	01 No
2.	Polisher converted to Cone sanding machine 2 HP 3 phase motor.	01 No.
3.	Infra-Red Oven (optional)	01 No.
4.	Bench Grinder Cum Sander 0.5 HP, single phase motor, Abrasive Wheel size 10 inch x1 inch	01 Nos.
5.	Pillar Drilling Machine Drilling capacity 25 mm, Pillar dia. 87 mm Maximum distance spindle to table 600 mm, Table working surface dia. 400 mm with 1 HP 3 phase motor.	01 No.
6.	Bench Drilling Machine with stand, Capacity ½ inch	01 No.
7.	Industrial Leather and Canvas Sewing Machine with ¼ HP motor	01 No.
8.	Adjustable Circular Saw Circular saw dia.18", Working table size 24"x36" Maximum depth of cut 5½" with 3 HP 3 phase motor	01 Nos.

9.	Belt and Disc Sander Disc dia. 10 inches, belt size 6"x48" with 1 HP 3 phase motor	01 No.
10.	All-purpose saw , temperature range 100-600 degrees c, power input 2000w	01 No.
11.	Hot Air Gun Temperature range 100-600 degrees C, Power input 2000W	01 No.
12.	Jig Saw Machine sawing depth in wood 54 mm, rated input 350W	01 No.
13.	High vacuum machine with ¼" HP motor	01 No.
14.	Removable Mandrills	03 Nos.
15.	Mandrill for air suction mounting and Draping for sockets	03 Nos.
16.	Hot water bath for softening low Temperature thermoplastic sheets	01 No.
17.	Draping frame size (small)	02 Nos.
18.	Draping frame size (small)	02 Nos.
19.	Adjustable / fixed grinding and milling machine with dust collector	01 No.
20.	Sanding roll	02 Nos.
21.	Sanding sleeve	02 Nos.
22.	Sanding drum	02 Nos.
23.	Tool holder	05 Nos.
24.	Deep drawing tool set	02 Nos.
25.	Rasp head	01 No.
26..	Hot sealing iron	02 Nos.
27.	Staple gun	02 Nos.
28.	Hand Drill machine	04 Nos.
29.	Cord less hand drill machine	02 Nos.
30.	Instrumented GAIT ANALYZER AND TRAINER (optional for BPO program)	01 No.
31.	Shoe finishing machine	01 No.
32.	Working table with peg board (minimum 10 tables are required for 10 students)	10 Nos.
33.	Over locking machine	01 No.
34.	Laser aligner	01 No.
35.	Lathe Machine	01 No.
36.	Inter locking machine	01 No.

ii. LISTS OF COMMON TOOLS AND MATERIAL

Sl. No.	Name of Equipment / tool	Minimum Requirements
1.	Flat file bastard 2nd cut 10", 2nd cut 12"	10 no. each
2.	Aluminum Flat File 10" & 12"	10 no. each
3.	Round file 6", 8", 2nd cut	10 no. each
4.	Flat file 10" round 2nd cut	10 no each
5.	Triangular file 6", 10" 2nd cut	10 no each

6.	Rasp file half round 10", 12", 8"	10 no. each
7.	Rasp file flat 10", 12"	10 no. each
8.	Rasp file round 6", 10"	10 no. each
9.	Screw driver 150x6mm, 200x8mm, 250x8mm	10 no. each
10.	Flat chisel 12mm, 20mm, 25mm	2no. each
11.	Cold chisel 12mm, 20mm	2no. each
12.	Half round chisel 12mm, 20mm	2 no. each
13.	Ruler steel 600mm, 300mm	2no. each
14.	Steel square with leg 200mm	2 no. each
15.	Caliper inside/outside 200mm	2no. each
16.	Compass/ Driver 200mm Outside/inside caliper	2 no. each
17.	Hammer ball peen 500 gms, 250gms	10 no. each
18.	Mallet hammer with handle	2no. each
19.	Hammer seaming plier (pincer) 10", 12"	4 no. each
20.	Nipper 150mm, 200mm	2 no. each
21.	Plier 200mm	10 no. each
22.	Long nose plier 150 mm	10 no. each
23.	Revolving Hole punch 250gms	10 no. each
24.	Centre punch	10 no. each
25.	Hole punch 2mm, 3mm	3 no. each
26..	Hole punch set	2 no.
27.	Scissor 10" & 12 "	10 no. each
28.	Hacksaw Frame 300mm	10 no.
29.	Hacksaw blades 300mm	1 pkt of 144 pc
30.	Tap set 3, 4, 5, 6, 7,mm	2 no. each
31.	Tap handle	2 no. each
32.	Grip plier	10 no.
33.	Die set 3, 4, 5, 6, 7,mm	2 no. each
34.	Cross pein hammer	10 no.
35.	wire cutter	10 no.
36.	Measuring tape	10 no.
37.	Shoe maker hammer	5 no.
38.	Anvil	2no.
39.	Half round leather Knife (Rapi)	5 no.
40.	Nipper shoe maker 8"	5 no.
41.	Leather knife	2 no.
42.	Bender brace 5.5 mm	1 no.
43.	Bender brace 6.5 mm	1no.
44.	cone sander fine, medium, coarse	10 no. each
45.	Plaster knife 150x200mm, 2000x750x350mm	10 no.
46.	Upper Limb Prosthetic Kit (B/E, A/E, S.D) body powered	2 no. each
47.	Externally powered kit (B/E & A/E)	1 each
48.	Vice limb maker (modified)	1 no.
49.	Bending fork (Set of two pieces)	2 no.
50.	Caliper A-P measurement above knee	2 no.

51.	Ear Protector	05 no.
52.	Nut replacement tool 7mm, 9mm	2 no. each
53.	Heat proof gloves	4 pairs
54.	Copper rivets ¼", ½"	1 kg each
55.	Aluminium rivets ¼", ½"	1 kg each
56.	Eyelet punch	10 no.
57.	Rivet head finishing punch	10 no.
58.	Plastic D-rings 1", 1 ½", & 2"	5 pkts each
59.	Buckles 1", 1 ½' & 2"	5 pkts each
60.	Micrometer	2 no.
61.	Ritz scale for M-L diameter/ALIMCO B.K. caliper	2 no.
62.	Allen keys / T-handheld Allen keys (1mm-10mm)	10 set
63.	Press button	5 pkts
64.	Evathene foam 4mm, 6mm, 8mm thickness	5 sheets each
65.	Polypropylene and co polymer sheets (white) 3mm, 4mm & 5mm thickness	5 sheets each
66.	Dendrite solution	5 ltr (5 tin)
67.	Velcro straps (hook & loop) ¾", 1" and 2"	2 roll each
68.	Nappa leather	5000 d/m
69.	Low temperature thermo plastic sheets 3.2mm/4.2 mm thickness	5 sheets each
70.	Aluminum strips (4mm) thickness	5 kg.
71.	Aluminium sheet (4mm thicknes), 1 mm=18 gauge (BSW)	2 sheet
72.	Drill bits, Full Set Max diameter (7/64", 1/8", 9/64", 5/32", 3/16", 11/64", ¼", 3/8", ½")	1 set
73.	Different modular system for lower limb prostheses	5 set each
74.	Torque wrench	01
75.	Bench Vice	10
76.	Vernier Caliper (adjustable digital)	10
77.	V-BOX	02

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

Sl. No.	Name of Equipment	Minimum requirements
1.	Measuring tape	10
2.	Flexible steel rule	10
3.	Aluminium tripod	02
4.	Casting apparatus under Weight bearing	02
5.	Casting apparatus for Above knee amputee	01
6.	Plaster bandage trolley	01
7.	Foot measuring device	01
8.	Oscillating saw – Multimaster	02
9.	Spinal casting apparatus	02
10.	Hook knife	05
11.	Plaster cutting scissors	04

12.	Examination couch	02
13.	X-ray image viewer	02
14.	Goniometer	05
15.	Pedobarography machine	01

D. PLASTER MODIFICATION AREA / ROOM

Sl. No.	Name of Equipment	Minimum requirements
1.	Plaster work table	02
2.	Plaster cast shelf	01
3.	Pipe vice	05
4.	Plaster bucket	05
5.	Mixing bowl	20
6.	Plaster stirrer	20
7.	Surform file flat	20
8.	Surform file round (blade only)	15
9.	Surform file half round (blade only)	15
10.	Plaster spatula	15
11.	Tape measure	10
12.	Goniometer	05
13.	Special plaster knife	05
14.	Draw knife	02
15.	Plaster cutting scissors	04
16.	Mandrills	20
17.	Plaster separation sink	01

E. PATIENT TRIAL AREA

Sl. No.	Name of Equipment	Minimum requirements
1.	Parallel bar with mirror on Both side	01
2.	Portable heat gun	01
3.	Chordless hand drill machine	01
4.	Revolving centre punch	05

SECTION VII

CODE OF ETHICS

An appropriate code of ethical behavior is an essential framework for the activities of any professional responsible for the treatment of patients. All Prosthetics & Orthotics professionals need to follow the code of ethics formulated by Rehabilitation Council of India (RCI).

Ethical code of the Prosthetist / Orthotist

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

Material Cost

Labour cost

Overhead cost

method of costing

Job

Batch

Contract Costing

Cost control - NO