सत्यमेव जयते

भारतीय पुनर्वास परिषद्

Curriculum Framework

Bachelor in Prosthetics and Orthotics

(B.P.O.)

Norms, Regulations & Course Content

2025

Effective from Academic Session (2025-26)
Four Years and Six Months Duration

REHABILITATION COUNCIL OF INDIA

(Statutory Body of the Ministry of Social Justice & Empowerment) Department of Empowerment of Persons with Disabilities (Divyangjan) Government of India

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

Email: rci[dash]depwd[at]gov[dot]in

www.rehabcouncil.nic.in

Bachelor in Prosthetics and Orthotics (B.P.O.) Program

I. PREAMBLE

The World Health Organization (WHO) describes Prosthetics and Orthotics as a specialized health care profession that combines a unique blend of clinical and technological skills. The Prosthetic and Orthotic Professionals assess, evaluate patients; prescribe, design, fit, user training and follow up the orthoses, prostheses and assistive devices. Prosthetic and Orthotic Professionals also provide appropriate user training for biomechanical adaptation for functional mobility and comfort.

Medical Rehabilitation of persons with locomotor infirmity /disabilities and neuromuscular disorders is a teamwork, where the Centre of attention is the persons with disability or who need appropriate prosthetic or orthotic or assistive devices intervention. This work requires a substantial clinical and technical blend and analytical decision. Prosthetic and Orthotic Professionals not only provide service to persons with neuro-musculoskeletal disorders and persons with disability, but they also render services to general health and work-related disorders such as foot disorders, fractures, 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 amputees and other neuro-musculoskeletal disorders. Prosthetics and Orthotics Professionals make the patient independent & active contributors to society through comprehensive prosthetic and orthotic rehabilitation and palliative interventions.

Access to prostheses, orthoses, and other assistive devices can mediate the process of social inclusion, improve the quality of life for persons with disabilities and anybody having a physical impairment or functional limitations. This will enable them to live healthy, productive, independent, and dignified lives and to participate in education, the labor market, and social life.

The UNCRPD and the Sustainable Development Goals (SDGs) are global initiatives that aim to create an inclusive society where everyone can contribute to the country‘s development. But in India, we are yet to achieve the desired goals due to the lack of awareness, affordability of technologically appropriate prostheses, orthoses, and assistive technology. As per section 9.3 (i)of NEP 2020, It has been affirmed to revitalize the education system to provide a range of appropriate measures for equity, accessible and inclusive education to all, especially students with disabilities. Therefore, attempts have been made to revise the existing

curriculum for appropriate, affordable and available adaptive prosthetic and orthotic devices to fulfill the criteria laid down under the provision of NEP 2020

The Government of India is putting all efforts to ensure "the approach to improve access to assistive technology and products, including prostheses and orthoses," and everyone should have sufficient access to it for sustainable growth and an inclusive society.

According to the 2011 census, there are 26.8 million people with disabilities in India, out of which 20% or 5.4 million have locomotor disabilities. Moreover, there are 138 million elderly people and 2-3% school going children suffer from pes planus, knock knee, scoliosis and other musculoskeletal disorders. They may require some form of prosthetics, orthotics and assistive technology intervention. Therefore, the total potential demand for prostheses, orthoses and assistive technology intervention in India is around 250 million people. To achieve the 2030 Agenda, it is the need of time to ensure that prosthetics and orthotics services are accessible and affordable for all. According to the World Health Organization, one Prosthetics and Orthotics Professional is needed for every 250 persons with physical disabilities and neuro-musculoskeletal disorders. Hence, more than 1,00,000 Prosthetics and Orthotics Professionals are required to meet the current demand for prosthetics,orthotics and assistive technology Intervention for persons with physical disabilities and neuro- musculoskeletal disorders in Indian society.

This document is in the form of curriculum and guidelines for the program structure for the duration of 4 years and 6 months so that a wide range of knowledge and skills can be inculcated to the students during the program. The program aims to develop human resources in the field of prosthetics and orthotics & Assistive Technology to meet the increasing demand of society in light of the New Education Policy (NEP-2020), National Credit Framework (NCrF-2022), RPwD Act (2016), and the advancement of technology.

II. NOMENCLATURE

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

III. OBJECTIVES:

The B.P.O. programme aims to develop Prosthetics and Orthotics professionals who can provide prosthetics, orthotics and assistive technology services in various settings such as hospitals, rehabilitation & clinical

settings and other Government/Non-Government Organization. The B.P.O. programme will prepare human resources to enable them to acquire knowledge and develop competencies and skills to render clinical prosthetics and orthotics service in pediatric, orthopedics, neurology, diabetics, general surgery, plastic surgery, emergency, trauma and other conditions including rehabilitation of persons with physical disabilities and neuro-musculoskeletal disorders.

At the end of program, the learner shall be able to

1. Assess, prescribe and provide comprehensive prosthetic and orthotic management to the individual across their lifespan and the community appropriate to his/her position as a member of the healthcare team.
2. Be competent to take preventive, supportive, corrective and rehabilitative steps in respect to the commonly encountered problems related to prosthetics and orthotics.
3. Demonstrate competence in carrying out Evidence Based Practice in prosthetics and orthotics
4. Appreciate the psycho-social, cultural, economic, and environmental factors affecting health, and develop a humane attitude towards the patients/relatives, in discharging one‘s professional responsibilities
5. Be familiar with the various National policies and acts related to the empowerment of Persons with Disabilities.
6. Acquire management & administrative skills in the areas of materials, financial and human resources related to prosthetics and orthotics
7. Demonstrate proficiency in communication skills to work effectively in an inter/intra professional collaborative setting.
8. Practice prosthetics & orthotics ethics in patient care, service delivery, and research.
9. Integrate knowledge of the biosciences and public health with specialist discipline knowledge in the practice of prosthetics and orthotics.
10. Develop an attitude for self-learning and acquire necessary skills including the use of appropriate technologies.
11. Demonstrate & practice social and professional responsibilities and ethical behaviors in patient care, service delivery, and research.

IV. SCOPE OF THE PROGRAMME

An estimated 1 billion people need Prosthetic/Orthotic and other Assistive products, and this number is anticipated to grow to 2 billion by 2050. A significant workforce shortfall exists in the field of prosthetics/orthotics, with a limited number of training programmes around the world. The World Health Organization indicates that only 1 in 10 persons who require prosthesis or orthosis have access to appropriate services. Globally, health professional education needs to transform and expand in response to the evolving needs of persons with disabilities and the aging population.

To achieve the objective of Government of India for Universal Health Coverage, skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having P&O Professionals in the healthcare system are still unexplored in India. Although an enormous amount of evidence suggests that the benefits of P&O Professionals range from improving access to healthcare services to a significant reduction in the cost of care, the Indian healthcare system still requires it to be more inclusive and open. The privatization of healthcare has also led to an ever-increasing out-of-pocket expenditure by the beneficiaries. However, many examples assert the need of skilled allied health professionals in the system, such as in the case of stroke survivors, spinal cord injuries, diabetic foot care, fractures and congenital anomalies. It is the support of P&O Professionals that significantly enhances their healing, maintains proper physiological comfort and rehabilitation and long-term return to normal life.

The following prosthetic/ orthotic education in line with international standards aims to ensure that programmes have the infrastructure and resources to develop students into entry-level practitioners that can increase access to services and provide the appropriate quality of prosthetic/orthotic services.

Thus, the breadth and scope of the P&O practice varies from one end to another, including areas of work listed below:

a. Across the age span of human development from neonate to old age.
b. With patients having complex and challenging problems resulting from systemic illnesses such as in the case of diabetes, and elderly care to name a few.
c. Towards health promotion and disease prevention, as well as assessment, management and evaluation of interventions and protocols for treatment.
d. In a broad range of settings from a patient's home to a community, primary care centers, to tertiary

care settings; and

e. With an understanding of the healthcare issues associated with diverse socio-economies and cultural norms within the society.
f. Become an integral member of healthcare teams in hospitals, pediatric clinics, geriatric clinics, podiatric clinics, diabetics and foot care units and rehabilitation centers.
g. Diagnose, Assess, and Prescription of Orthoses, Prostheses, and Assistive Devices to the individual who needs such devices
h. Understanding of Various disabilities and associated conditions.
i. Engage in Legislative provisions and policy guidelines for Divyangjan (PwDs)
j. Can work in community health care, rural & Public Health (Private and Government Organizations.)
k. Understanding of various materials used in the Prosthetics and orthotics field.
l. Management and Supervision of clinical and training services.
m. Administration, Management and Human Resource Development in the field of Prosthetics and Orthotics in various Rehabilitation settings.
n. Physical/chemical and mechanical properties of materials and their allergic effects on patients, if any.

PRACTICE SETTINGS

Prosthetics and Orthotics services are delivered in a variety of settings which allow it to achieve its purpose. Prevention, health promotion, treatment/intervention, habilitation and rehabilitation take place in multiple settings that may include:

- Orthotic and prosthetic facilities
- Hospitals and Super Specialty clinics
- Sports and Ergonomics
- Acute care facilities
- Rehabilitation facilities
- University, education and research facilities
- Rural outreach clinics
- Home health settings
- Skilled nursing facilities
- Community based rehabilitation programmes

- Community settings including primary health care centers, and field settings
- Occupational health centers
- Out-patient clinics
- Private offices, practices, clinics
- Public settings for health promotion
- Schools, including pre-schools and special schools
- Senior citizen centers
- Sports centers/clubs
- Workplaces/companies

WHO ARE PROSTHETICS AND ORTHOTICS PROFESSIONAL

A Prosthetist and Orthotist is defined as ‗a person who has completed the minimum degree and above course of education and training from a recognized University and approved by an appropriate National authority (Rehabilitation Council of India, as per RCI Act 1992) to assess, prescribe, design and fit appropriate prostheses /orthoses.‘‘

― Prosthetists and Orthotists are clinicians trained to assess the needs of the user, prescribe treatment, design, fit appropriate prosthesis/orthosis and evaluate treatment outcomes.‖

(Reference: WHO Standards of Prosthetics and Orthotics Part-2 Area-3. Personnel, 3A-Service Unit Personnel)

SCOPE FOR PROSTHETICS AND ORTHOTICS PROFESSIONALS IN THE INDIAN HEALTHCARESYSTEM.

In many parts of the world, the awareness and benefits of the development of Prosthetics and orthotic devices have not been extended to all. In a low economic country/low literacy country, traditionally the people still believe that Prosthesis/Orthosis means ―An Artificial Limb, A Shoe, A Caliper or a rudimentary plastic pipe device, wooden/metallic device limited to use of Disability/for Divyanjan‖. However, WHO overhauled a complete health care system inclusive of Prosthetics and orthotics devices for optimum result and best care of human beings.

The quality of healthcare has improved tremendously in the last few decades due to the advances in technology, thus creating fresh challenges in the field of healthcare. It is now widely recognized that health

service delivery is a team effort involving both clinicians and non-clinicians. ―Prosthetics and orthotics services‖ is not limited to services to Divyanjan/Disabilities but an umbrella term for the combination of inputs, such as policy (Act/Rules/scheme), products (components and material), personnel, required to deliver the appropriate prostheses, orthoses, Assistive device and related therapy.

The acceptance of conservative treatment has been well established in the Indian health care system since ancient history. As per the evidence in rural areas, it has been reported that ―people often avoid surgery in phocomelia and other congenital anomalies/absence/extra growth of limb segment, in acute or post mal-united fracture, metabolic disorders, diabetic neuropathy and other conditions‖. A large segment of the population (more than 70%) lives in rural areas where prosthetics and orthotics services are essential to manage the conservative treatment in the best possible manner.

In normal health care system, the different department/section starting from pediatric to geriatric, orthopedics to general surgery, oncology to plastic surgery, gynecology to obstetrics, emergency to neurology and other sections lacks awareness on the scientific role of appropriate prosthetics and orthotics devices and they largely depend on ready-made prefabricated product available in surgical appliances/medical shop where users adjust as per the product specification without any option. A qualified Prosthetist and Orthotist is a part of healthcare service delivery system and takes a leading role in assessment, design and measurement, fitment of appropriate accurate customized scientific devices and its follow up action including training under supervision of head of respective section/department for best possible treatment of users.

The interventions are usually part of the healthcare continuum, such as providing therapeutic or protective footwear in the treatment of a diabetic or neuropathic foot, fitting prosthesis after amputation or provision of an orthosis to support a paralyzed limb after a stroke. Timely prosthetics and orthotics service provision is important to restore functioning and to prevent secondary deformities. With other interventions, such as education, skills training, job coaching, placement and social support, prosthetics, orthotics and rehabilitation services contribute towards the overall aim of optimal functioning and hence full participation and inclusion in society.

Prosthetics and orthotics services have important benefits at various levels. Appropriate provision improves the functioning of people with physical impairments or functional limitations, which increases their mobility and functioning and helps them stay active and productive. This, in turn, increases their independence, self-determination, participation in society and well-being and helps them to lead longer, dignified lives of higher quality. For many users, prostheses and orthoses allow them to gain access to

education and work. Prosthetics and orthotics services thereby contribute to removing barriers and integrating people with physical impairments or functional limitations into society and giving them equal opportunities, as is their right.

Access to prosthetics and orthotics services is essential for people with structural or functional limitations not only to achieve mobility and independence but also to enjoy their human rights in the same way as others in the community. Thus, the breadth and scope of the P&O practice varies from one end to another, including areas of work listed below:

- Across the age span of human development from neonate to old age.
- With patients having complex and challenging problems resulting from systemic illnesses such as in thecase of diabetes, and elderly care to name a few.
- Towards health promotion and disease prevention, as well as assessment, management and evaluation of interventions and protocols for treatment.
- In a broad range of settings from a patient's home to community, primary care centers, to tertiary care settings; and
- With an understanding of the healthcare issues associated with diverse socio-economies and cultural norms within the society.
- Become an integral member of healthcare teams in hospitals, pediatric clinic, geriatric clinic, podiatric clinic, diabetics and foot care unit and rehabilitation centers.
- Diagnose, Assess, and Prescription of Orthoses, Prostheses, and Assistive Devices to the individual who needs such devices
- Understanding of Various disabilities and associated conditions.
- Engage in Legislative provisions and policy guidelines for Divyangjan (PwDs)
- Can work in community health care, rural & Public Health (Private and Government Organizations.)
- Understanding of various materials and technology used in the Prosthetics and orthotics field.
- Management and Supervision of clinical and training services.
- Administration, Management and Human Resource Development in the field of Prosthetics and Orthotics in various Rehabilitation settings.
- Physical/chemical and mechanical properties of materials and their allergic effects on patients, if any.

CODE OF ETHICS FOR PROSTHETICS AND ORTHOTICS PROFESSIONALS

1. He/she shall observe loyal relations with his/her colleagues and with other members of the clinic team without assuming roles outside his/her own profession.
2. He/she shall practice absolute discretion regarding personal matters or knowledge he/she might acquire in his/her professional work.
3. He/she, like all other members of the clinic team, should supply service only as a member of that team and respect its conclusions.
4. He/she shall collaborate freely in the necessary exchange of information between colleagues and others in different but related disciplines.
5. He/she shall strive to perform to the highest possible standard of his/her professional skill.
6. He/she shall provide services to users in a professional manner; personal, financial or commercial interests shall be secondary.
7. He/she shall always honestly represent himself/herself as well as his/her services to the patient and all others concerned.
8. He /she shall treat all patients fairly and in a timely manner.
9. He /she provides quality services to patients, by utilizing all necessary professional resources in a technically appropriate and efficient manner.
10. He/she shall maintain the confidentiality and privacy of all patient information, unless: the information pertains to illegal activity; the patient expressly directs the release of specific information; or, a court or government agency lawfully directs the release of the information;
11. He/she shall respect and promote the rights of patients by offering only professional services that he/she is qualified to perform, and by adequately informing patients about the nature of their conditions, the objectives of the proposed treatment, treatment alternatives, possible outcomes, and the risks involved.
12. He/she shall avoid conduct which may cause a conflict with patient interests and disclose to patients any circumstances that could be construed as a conflict of interest or an appearance of impropriety, or that could otherwise influence, interfere with, or compromise the exercise of independent professional judgment.
13. He/she shall respect the intellectual property and contributions of others; and maintain a record.

V. GENERAL FRAMEWORK OF THE COURSE

a) DURATION OF THE PROGRAM

Duration of the program will be of 4 years followed by 6-month compulsory internship. Each year will have 1200 hours.

INTERNSHIP

Internship is compulsory.

Duration: 6 months

Eligibility: Internship will start immediately after the declaration of result of final year/ semester candidate is declared pass in all four years / eight semesters

Structure and duration of the postings: The place of postings of the students for internship will be decided by the respective institute conducting the course.

Mode of supervision during internship: Supervision should be provided by a Prosthetics and Orthotics Professional having valid registration with Rehabilitation Council of India. 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/organization/ institution or his/her nominee where the student is undergoing internship.

Extension of internship: Internship shall be extended by the number of days the student remains absent.

Stipend: As per the norms of the parent Institute / university.

Grading and evaluation of students: 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.

Certification: The parent institute/affiliating University will award a certificate after successful completion of the internship.

The University shall award the degree certificate only after the successful completion of the internship.

b) ELIGIBILITY FOR ADMISSION

A candidate who has passed 10+2 in science or equivalent with Physics, Chemistry, Biology/Mathematics and English with a minimum aggregate 50% marks in PCBE/ PCME will be eligible for admission to this course. Relaxation and reservation for SC/ST/OBC/PWD and other categories shall be as per the rules/instructions of the Central Govt /State Govt whichever is applicable.

Lateral Entry for Diploma in Prosthetics and Orthotics (D.P.O.) holders

Candidates who have passed D.P.O. from a RCI recognized institute shall be eligible for admission directly in 3rd year.

- ✔ Candidates who have passed D.P.O. from a RCI-recognized institute shall be eligible for admission directly in 3rd year/5th Semester of B.P.O. Programme.
- ✔ Admissions will be on the availability of the seats within sanctioned seats by the Council.
- ✔ In-service candidates may be permitted to undergo an internship at their parent organization. Admission process as per affiliating University norms.

ADMISSION PROCESS AS PER AFFILIATING UNIVERSITY NORMS

All reservations in admission will apply as per Govt. rules for aided and Govt. institutions. The infrastructure will have to be enhanced as per the seats getting increased under reservation policy. Foreign nationals who meet the eligibility criteria may also be allowed to take admission in the BPO program as per the guidelines issued by the Government of India

C) MEDIUM OF INSTRUCTIONS: ENGLISH

d) METHODOLOGY

The curriculum is planned for fulltime and physical mode or face to face mode similar to all other bachelor courses. The transactional methodology of the programme includes lectures, demonstration, assignment project work, quiz and discussions, visits to various prosthetics and orthotic centers, practice teaching, participation in community meetings, medical camps and community development programmes.

In first year students will make use of techniques used in the table given below. The use of these techniques addresses many issues such as suboptimal use of resources and equipment, by adequately training the manpower on newer technologies, limitations for imparting practical training in real-life scenarios, and ineffective skills assessment methods among others.

Teaching modality	Learning opportunity examples
Patients	Teach and assess in selected clinical scenarios
	Practice soft skills
	Practice physical examination
	Receive feedback on performance
Mannequins	Perform acquired techniques
	Practice basic procedural skills
	Apply basic science understanding to clinical problem solving
Simulators	Practice teamwork and leadership

e) INTAKE CAPACITY

The intake per year 30 minimum and higher as per the infrastructure

f) MINIMUM ATTENDANCE/WORKING DAYS

The program 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 andconsultation as and when needed. No student will be allowed to appear in the examination unless she/he has attended at least 75% of the total number of classes in theory and 80 % in practical.100%attendance in internship is compulsory.

g) SEMESTER/ANNUAL PROGRAMME STRUCTURE WITH BREAK UP OF HOURSAND CREDITS (THEORY/PRACTICAL)

(a) The first year will comprise 600 hours of practical and 600 hours of theory.

b) The second year will also have 1200 hours which will include 630 hours of practical and 570 hours of theory.

c) The third year will also have 1200 hours which will include 780 hours of practical and 420 hours of theory.

d) The fourth year will also have 1200 hours which will include 900 hours of practical and 300 hours of theory.

(e) The theory hours will also include 60 hours of Employability skills (Soft Skills).

CREDIT POINT DISTRIBUTION:

THEORY: -30 notional hours = 1 credit

Tentative Notional Hours

1. 15 hours 'lecture hour or direct classroom hour on face-to-face mode teaching
2. 5 hours 'counseling/guidance/query-based learning/doubt clearing session with small group learning (sample size of focus group preferable less than 10 students at a time) or individual learning or differentiated instructions
3. 5 hours 'self-study/presentation and discussion by student/peer/group
4. 2 hours on verification and feedback on teacher 's home task/assignment
5. 2 hours on diagnostic measures and guidance
    a. To Identify the students who are having trouble or need help on a particular topic
    b. To Locate the errors or learning difficulties
    c. To find out the causal factors of slow learning and to take necessary measures
6. 1 hour on internal assessment and feedback

PRACTICAL: - 30 notional hours =1 credit

As per guidelines of National Credit Framework (NCrF-2022), the internship program for 06 months may be considered as 600 hours and 10 credits point to Academic Bank of Credits

RCI also recommends practical work for each theory course besides these contact hours including self-study, assignments, etc. That may involve the same number of hours as are the contact hours specified for each course.

The 10-point grading system following letter grades recommended by the UGC as given below:

Grades and Grade Points

Letter Grade	Grade Point	% of marks
O (Outstanding)	10	80 and above
A+ (Excellent)	9	75-79
A (Very Good)	8	70-74
B+ (Good)	7	65-69
B (Above Average)	6	60-64
C (Average)	5	55-59
P (Pass)	4	50-54

F (Fail)	0	<50
Ab (Absent)	0	0

a. A student obtaining Grade F shall be considered fail and will be required to reappear in the examination.

b. For non-credit courses _Satisfactory ‘or _Unsatisfactory ‘shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

c. The Universities can decide on the grade or percentage of marks required to pass in a course and the CGPA required to qualify for a degree taking into consideration the recommendations of the statutory professional councils.

FIRST YEAR

Course Code	Title	Theory Hrs	Practical Hrs	Total Hrs	Credit Points	Internal Marks	External Marks	Total Marks
BPO101	Anatomy	120	30	150	05	25	75	100
BPO102	Physiology	60	30	90	03	25	75	100
BPO103	Materials Science and P&O Lab Technology	60	30	90	03	25		100
BPO104	Biomechanics & Kinesiology	90	--	90	03	25	75	100
BPO 105	Applied Mechanics	60	--	60	02	25		100
BPO 106	Electronics	60	--	60	02	25		100
BPO 107	Prosthetic Science-I	90	--	90	3	25	75	100
BPO 108	Orthotic Science-I	90	--	90	3	25	75	100
PRACTICAL EXAMINATION								
BPO 151	Prosthetic Science-I	--	240	240	08	25		100
BPO 152	Orthotic Science-I	--	240	240	08	25		100
	Total	630	570	1200	40	250		1000

Number of Theory Paper: 08

Number of Practical Exam: 02

SECOND YEAR

Course Code	Subjects	Theory Hrs	Practical Hrs	Total Hrs	Credit Points	Internal Marks	External Marks	Total Marks
BPO201	Pathology	60	00	60	2	25	75	100
BPO202	Pharmacology & Emergency Medicine	60	00	60	2	25	75	100
BPO203	Orthopedics and Amputation Surgery	90	00	90	3	25	75	100
BPO204	Assistive Technology	60		60	2	25	75	100
BPO205	Diagnostic Skills, Physical & Functional Assessment	90		90	3	25	75	100
BPO206	Prosthetic Science-II	90	--	90	03	25	75	100
BPO207	Orthotic Science-II	120	--	120	04	25	75	100
PRACTICAL EXAMINATION								
BPO 251	Prosthetic Science-II	--	210	210	07	25	75	100
BPO252	Orthotic Science-II	--	330	330	11	25	75	100
BPO 253	Assistive Technology	--	90	90	03	25	75	100
	Total	570	630	1200	40	250	750	1000

Number of Theory Paper: 07

Number of Practical Exam: 03

THIRD YEAR

Course Code	Subjects	Theory Hrs	Practical Hrs	Total Hrs	Credit Points	Internal marks	External Marks	Total Marks
BPO301	Research Methodology and Biostatistics	60	00	60	02	25	75	100
BPO302	Clinical Biomechanics Gait &Posture Analysis	90	-	90	03	25	75	100
BPO303	Public Health and rehabilitation	90	--	90	3	25	75	100
BPO304	Clinical Orthotics Practice in Spinal pathologies and Disorder	60	--	60	02	25	75	100
BPO305	Clinical Prosthetic and Orthotic Practice in Surgical and Orthopedics Conditions	60	--	60	02	25	75	100
BPO30 6	Clinical Prosthetic and Orthotic Practice in Neurological Conditions	60	--	60	02	25	75	100
PRACTICAL EXAMINATION								
BPO 351	Clinical Orthotics Practice in Spinal pathologies and Disorder	--	240	240	08	25	75	100
BPO 352	Clinical Prosthetic and Orthotic Practice in Surgical and Orthopedics Conditions	----	240	240	08	25	75	100
BPO 353	Clinical Prosthetic and Orthotic Practice in Neurological Conditions	---	240	240	08	25	75	100
BPO 354	Assignment in Clinical Biomechanics Gait &Posture Analysis		60	60	02	25	75	100
	Total	420	780	1200	40	250	750	1000

Number of Theory Paper: 06

Number of Practical Exam: 04

FOURTH YEAR

Course Code	Subjects	Theory Hrs	Practical Hrs	Total Hrs	Credit Points	Internal Marks	External Marks	Total Marks
BPO 401	Clinical Prosthetics and Orthotics Practicein Pediatric	60	--	60	2	25	75	100
BPO 402	Clinical Prosthetics and Orthotics Practice in Podiatric, Sports and Diabetic Conditions	60	--	60	2	25	75	100
BPO 403	Digital Technology in Prosthetics and Orthotics	60	--	60	2	25	75	100
BPO 404	Employability and Soft Skill	60	--	60	2	25	75	100
BPO 405	Management and Administration	60	00	60	2	25	75	100
PRACTICAL EXAMINATION								
BPO 451	Clinical Prosthetics and Orthotics Practice in Pediatric	--	210	210	06	25	75	100
BPO 452	Clinical Prosthetics and Orthotics Practice in Podiatric, Sports and Diabetic Conditions	--	240	90	03	25	75	100
BPO 453	Digital Technology in Prosthetics and Orthotics	--	210	210	07	25	75	100
BPO 454	Project Work**	--	240	240	8	--	200	200
	Total	300	900	1200	40	200	800	1000

Number of Theory Papers: 05

Number of Practical Exams; 04

Note: - *All theory & Practical examinations in the discipline of Prosthetics and Orthotics shall be conducted only by the regularly appointed Prosthetic and OrthoticFaculty / Teachers from a teaching institution. Faculty with a Master's in Prosthetics and Orthotics to be allowed to act as internal examiners and guides.

h) EXAMINATION PATTERN

As per the respective University norms. Minimum passing marks for every subject will be 50% both in theory and practical. Each candidate will be given maximum n+ 2 attempts to clear the examination whether annual or semester. Annual Program with Continuous Assessment and Term End examination will be followed.

(1) NATURE OF EVALUATION

Internal assessment for theory Courses will not exceed 25% in the theory and practicum wherever applicable or as per respective University norms. Internal Assessment should be calculated by conducting minimum two class tests, two assignments, examination/practical examination and any other activities implemented by the parent organizations/university. Marks of Internal Assessment should be informed to the students prior to commencement of university examinations.

(2) TRANSITORY REGULATIONS

Whenever a course or scheme of instruction is changed in a particular year, two more examinations immediately following thereafter shall be conducted according to the old syllabus / regulations. Candidates not appearing at the examinations or failing in them shall take the examinations subsequently according to the changed syllabus / regulations/as per university norms.

Criteria of Passing: As per respective University norms

(3) ADEQUACY OF THE SYLLABUS

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

I)Dissertation (if any): Project work in 4th Year

j) CRITERIA OF PASSING: As per the respective University norms.

k) Board of Examiners/Examination Scheme: As per the respective University norms

l) AWARD OF DEGREE; Bachelor in Prosthetics & Orthotics as awarded by respective University.

After successful completion of all examinations, an internship candidate will be awarded with the degree of Bachelor in Prosthetics and Orthotics (B.P.O.). The said degree will be classified in accordance with the affiliating University norms.

m) Registration as Personnel/Professional and Category of Registration:

As per Section 13 of RCI Act, it is mandatory for every rehabilitation professional / personnel to obtain a ―Registered Personnel/Professional Certificate‖ from the Rehabilitation Council of India to work in the field of disability rehabilitation and special education in India. A Student who has attended the training and completed the requirements for all Units successfully will be qualified as a Prosthetist and Orthotist at the level of bachelor/master degree level – **PROFESSIONAL** and be eligible to work in the field of Rehabilitation and assistive technology in India as a **Prosthetist and Orthotist**. As continuous professional growth is necessary for the renewal of the certificate, the rehabilitation professional should undergo an in-service programme periodically to update their professional knowledge. Each registered professional will be required to get himself /herself renew his registration periodically. The periodicity will be decided by the council from time to time. The activities for enrichment training programmes in the form of Continuous Rehabilitation Education (CRE) is decided by the RCI

The training institution/organization should take appropriate action to ensure that all passed out students are registered with the Council.

VI. INFRASTRUCTURE REQUIREMENTS FOR STARTING THE COURSE

(Indicative/Suggestive, *latest RCI norms and revision if any from time to time may supersede all including below mentioned criteria)*

A. HUMAN RESOURCE REQUIREMENT

Sl. No.	**Core Faculty/Clinical Staff**	**Column-I Up to 30 seats**	**Column-II up to 60 seats**	**Column-III up to 80 seats**
1.	Professor & Head Department of Prosthetics & Orthotics	01	01	02
2.	Associate Professors (Prosthetics & Orthotics)	01	02	04
3.	Assistant Professor /Lecturer (Prosthetics & Orthotics)	02	04	08
4.	Demonstrator(P&O)	04	08	08
CLINICAL STAFF				
5	Prosthetist and Orthotist	04	09	010

B. TEACHER STUDENT RATIO: As per RCI Norms

C. PROFESSIONAL QUALIFICATION OF FACULTY IN THE CORE AREAS (Ref: RCI MRR F.No.7-128/RCI/2021 12th May 2021)

S. N.	DESIGNATION	QUALIFICATION & EXPERIENCE in UniversityDepartment	PAY SCALE
1.	Professor (Prosthetics & Orthotics)	**Essential:** a) Master in Prosthetics and Orthotics b) Ph.D. in the core areas c) 5 years teaching experience as Associate Professor in Prosthetics and Orthotics d) Valid RCI Registration **Desirable:** a) Minimum of five publications in index Journal b) Experience of Research Projects/ guiding	As per UGC norms

		research in Master/Doctoral level c) Outstanding achievement in the field of Prosthetics & Orthotics	
2.	Associate Professor (Prosthetics & Orthotics)	**Essential:** a) Master in Prosthetics and Orthotics b) 10 years teaching experience at PG/UG level c) Valid RCI Registration **Desirable:** a) Ph.D. in the core areas b) Minimum of four publications in index Journal c) Experience ofguiding research/Thesis at Master level	As per UGC norms
3.	Assistant Professor/ Lecture (Prosthetics & Orthotics)	**Essential:** a) Master in Prosthetics &Orthotics b) Valid RCI Registration **Desirable:** 2 year experience in Prosthetics & Orthotics	As per UGC norms
4.	Demonstrator(P&O)	**Essential:** a) Bachelor in Prosthetics & Orthotics b) Valid RCI Registration **Desirable:** Master in Prosthetics & Orthotics	As per Institute norms
Clinical Staff			
5	Prosthetist & Orthotist/	**Essential:** a) Bachelor in Prosthetics & Orthotics b) Valid RCI Registration	As per Institute norms

NOTE:

- These qualifications are applicable for future recruitment. The case of teachers who are already holding teaching posts and have more than 10 years of teaching experience will continue to hold their posts in their respective institutions.
- Minimum qualification for Assistant Professor should be Master in Prosthetics and Orthotics.
- Minimum of 2 teaching faculty members in core areas will be required for giving recognition for the first year.
- Before the commencement of the second academic year one more Faculty member must be appointed.
- In case of Professor not being available, Readers/Associate Professors (additional) should be appointed to accommodate teaching, research guidance and administrative work.

GUEST/ PART TIME FACULTY REQUIREMENTS FOR THE FOLLOWING DISCIPLINES

1. Anatomy
2. Physiology
3. Pathology
4. Research Methodology & Biostatistics
5. Digital technology
6. Orthopedics & Amputation Surgery & Diagnostic skills
7. Pharmacology
8. Basic Electronics and Applied Mechanics
9. Neurology, Physical & Functional Assessment
10. (Ministerial staff & others are not included)

D.CLINICAL INFRASTRUCTURE

Institute should have a hospital set up with an OPD facility OR may have MoU with nearby hospital for Prosthetics & Orthotics clinical Practice. The institute should have adequate facilities for diagnostic evaluation of Neurological disorders, Diabetics, Fracture, post-surgical, spine, foot disorder, congenital anomalies, locomotor impairment and associated disorders, both functional and organically based. Load and variety of patients should be commensurate with the number of courses conducted and also to meet the clinical practicum requirement of each year of the course.

PROGRAM OUTCOME:

At the end of the program the student must be able to;

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

- Identify, prescribe and justify selection of appropriate materials and componentry in the fabrication of the prostheses or orthoses.
- Fabrication/ development of 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.
- 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.
- Maintain accurate records of patient treatment and follow up as well as confidentiality of such information.
- Communicate effectively with patients, 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 prostheses or orthoses.
- Understand the methodology of problem identification, problem solving in a process that includes all stakeholders, with the patient at the center.

E. 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 the students and teachers in the institute. There should be a separate budget for the library. The library committee should meet regularly to keep the library updated with current books, journals and other literature. Internet facilities should be provided in the library and to the faculty & students. The library should have proper lighting facilities and it should be well-ventilated. It should have a cabin for librarians with an 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 catalog-cabinets, racks for student‘s bags, book display racks, bulletin boards and stationery items like index cards, borrower‘s cards, labels, registers etc.

F. INFRASTRUCTURAL REQUIREMENTS:

As per affiliation norms RCI and University depending on student intake/year and sanction strength.

The basic guidelines as follows

1. PHYSICAL FACILITIES:

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.	Classrooms (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	06@100= 600
8.	Two students‘ common room (One for male& one for female students	1200
9.	One Office Room	150
10.	One course coordinator room	200
11.	Computer Laboratory Room	600
12.	Two Machinery Room	500
13	One Storeroom	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)	2000

Note: The above-mentioned space shall be used only for Prosthetics & Orthotics training only.

2. 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 facilities with a 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/ cupboards for keeping teaching aids or any other equipment needed for the conduct of classes.

3. Record Room

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.

4. Other Facilities

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

5. Fire Extinguisher

Adequate provisions for extinguishing fire should be available as per the local bye-laws.

6. Playground

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

7. Recreation

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

G. Office Furniture and equipment Course Coordinator / HOD Room:

There must be an adequate number of office rooms as per the norms and in proportion to the number of teaching faculty with telephone and internet connection. Senior faculty members in the discipline of Prosthetics and Orthotics shall be course coordinator/ HoD. The coordinator/HoD will be the controlling and informant authority for the correspondence related to the BPO program. He/she must hold qualification as laid down by RCI.

H. LIST OF TOOLS AND EQUIPMENT REQUIRED FOR BPO TRAINING

1. LIST OF COMMON EQUIPMENTS

S.No.	Name of Equipment	Minimum Requirement
1.	Hot air oven, heating chamber size-36‖ wx24‖ dx30‖h, with double layer toughened front visible glass with inside light arrangement, max temp.350°c12 kw rating and 1 hp3 phase motor for fan with digital timer. Thermostat temperature controller.	1no.
2.	Polisher converted to cone sanding, 2 hp 3 phase motor	1no.
3.	Infrared oven	1no.
4.	Bench grinder cum sander, 0.5 hp single phasemotor, abrasive wheel size10‖x 1‖	1no.
5.	Pillar drilling machine, drilling capacity 25mm, pillardia 87mm max. distance spindle to table 600mm, table working surface dia 400mm with 1hp 3 phase motor	1no.
6.	Bench drilling machine with stand, capacity ½‖Hp	1no.
7.	Industrial leather and canvas sewing machine with ¼‖ HP motor	1no.
8.	Adjustable circular saw, circular saw dia 18‖, working table size 24‖x36‖, max depth of cut 5 ½‖with 3hp 3 phase motor	1no.
9.	Belt and disc sander, disc dia. 10‖, belt size 6‖x 48‖with 1 hp 3 phase motor	1no.
10.	All-purpose saw , temperature range 100-600 degrees c, power input 2000w	1no.
11.	Hot air gun, temperature range 100-600 degree c, power input 2000w	1no.
12.	Jig saw machine, sawing depth in wood 54mm, rated 350w	1no.
13.	High vacuum machine with¼‖ hp motor	1no.
14.	Removable mandrills	3no.
15.	mandrill for air suction mounting and draping for sockets	3no.
17.	hot water bath for softening low temperature thermoplastic sheets	1no.
18	Draping frame size(small)	2no.
19.	Draping frame size(large)	2no.

20.	Adjustable / fixed grinding and milling machine with dust collector	1no.
21.	Sanding roll	02
22.	Sanding sleeve	02
23.	Sanding drum	02
24.	Tool holder	05
25.	Deep drawing toolset	02
26	Rasp head	01
27.	Hot sealing iron	02
28.	Staple gun	02
29.	Hand drill machine	04
30.	Cordless hand drill machine	02
31.	instrumented gait analyzer and trainer (optional for BPO program)	01
32.	Shoe finishing machine	01
33.	Working table with pegboard	10
34.	Over locking machine	01
35.	Laser aligner	01
36.	Lathe machine (optional)	01
37	Interlocking machine	01
TOTAL		

2. Lists of common Tools and Material

S.No.	Name of Equipment/tool	Minimum Requirements
1.	Flat File Bastard 2nd Cut 10‖,2nd cut 12‖	10 no.each
2	AluminumFlatFile10‖& 12‖	10 no.each
3.	Round File 6‖,8‖,2nd cut	10 no.each
4.	Flatfile10‖round 2nd cut	10 no each
5.	Triangularfile6‖,10‖2nd cut	10 no each
6.	Raspfilehalfround10‖,12‖,8‖	10 no.each
7.	Raspfileflat10‖,12‖	10 no.each
8.	Raspfileround6‖,10‖	10 no.each

9.	Screwdriver150x6mm,200x8mm, 250x8mm	10 no.each
10.	Flatchisel12mm,20mm,25mm	2 no.each
11.	Coldchisel12mm,20mm	2 no.each
12.	Half round chisel12mm,20mm	2 no.each
13.	Ruler steel600mm,300mm	2 no.each
14.	Steel square with leg200mm	2 no.each
15.	Caliper inside/outside200mm	2 no.each
16.	Compass/ Driver 200mm Outside/inside caliper	2 no.each
17.	Hammer ball pein500gms,250gms	10 no.each
18.	Mallet hammer with handle	2no.each
19.	Hammer seaming plier(pincer)10‖,12‖	4no.each
20.	Nipper150mm,200mm	2no.each
21.	Plier200mm	10 no.each
22.	Long nose plier150mm	10 no.each
23.	Revolving Hole punch250gms	10 no.each
24.	Centre punch	10 no.each
25.	Hole punch 2mm,3mm	3no.each
26.	Hole punch set	2 no.
27.	Scissor10‖&12—	10 no.each
28.	Hacksaw Frame300mm	10no.
29.	Hacksawblades300mm	1pktof144 pc
30.	Tapset3,4,5,6,7,…….mm	2no.each
31.	Tap handle	2no.each
32.	Grip plier	10 no.
33.	Dieset3,4,5,6,7, … mm	2 no.each
34.	Cross pein hammer	10no.
35.	Wire cutter	10no.
36.	Measuring tape	10no.
37.	Shoe maker hammer	5 no.
38.	Anvil	2no.
39.	Half round leather Knife(Rapi)	5 no.
40.	Nipper shoemaker8‖	5 no.
41.	Leather knife	2 no.
42.	Benderbrace5.5mm	1 no.
43.	Benderbrace6.5mm	1no.
44.	Cone sander fine, medium, coarse	10 no.each
45.	Plasterknife150x200mm, 2000x750x350mm	10no.
46.	Upper Limb Prosthetic Kit(B/E,A/E, S.D) body powered	2no.each
47.	Externally powered kit(B/E&A/E)	1each
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	05no.

52.	Nutreplacementtool7mm,9mm	2no.each
53.	Heat proof gloves	4pairs
54.	Copperrivets¼‖,½‖	1 kg each
55.	Aluminiumrivets¼‖,½‖	1 kg each
56.	Eyelet punch	10no.
57.	Rivet head finishing punch	10no.
58.	PlasticD-rings1‖,1½‖,&2‖	5pktseach
59.	Buckles1‖,1½‘&2‖	5pktseach
60.	Micrometer	2 no.
61.	Ritz scale for M-L diameter/ALIMCO B.K.caliper	2 no.
62.	Allen keys/T-handheld held Allenkeys(1mm-10mm)	10set
63.	Press button	5pkts
64.	Evathene Foam 4mm,6mm,8mm thickness	5sheets each
65.	Polypropylene and copolymer sheets(white) 3mm, 4mm & 5mm thickness	5sheets each
66.	Dendrite solution	5ltr(5tin)
67.	Velcro straps(hook & loop)¾‖,1‖and 2‖	2rolleach
68.	Nappa leather	5000d/m
68.	Low temperature thermoplastic sheets 3.2mm/4.2mm thickness	5 sheets each
69.	Aluminum strips(4mm)thickness	5 kg.
70.	Aluminum sheet(4mm thickness),1 mm=18 gauge (BSW)	2sheet
71.	Drill bits, Full Set Max diameter (7/64‖, 1/8‖,9/64‖,5/32‖,3/16‖,11/64‖,¼‖,3/8‖, ½‖)	1 set
72.	Different modular system for lower limb prostheses	5seteach
73.	Torque wrench	01
74.	Bench Vice	10
75.	Vernier Caliper (adjustable digital)	10
76.	V-BOX	02

3. LIST OF TOOLS AND EQUIPMENT REQUIRED FOR PATIENT EXAMINATION AND CASTINGROOM

S.No.	Name of Equipment	Minimum Requirement
1.	Measuring tape	10
2.	Flexible steel rule	10
3.	Aluminum 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 – Multi master	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

4. PLASTER MODIFICATION AREA/ROOM

S.No.	Name of Equipment	Minimum Requirement
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.	Drawknife	02
15.	Plaster cutting scissors	04
16	Mandrills	20
17.	Plaster separation sink	01

5. PATIENT TRIAL AREA

S.No.	Name of Equipment	Minimum Requirement
1.	Parallel Bar With Mirror On Both Side	01
2.	Portable heat gun	01
3.	Cordless hand drill machine	01
4.	Revolving center punch	05

VII. PROGRAMME CONTENT

FIRST YEAR

TITLE- ANATOMY
COURSE CODE--- BPO101
TEACHING HOURS-120 (Theory) + 30 (Practical/Demonstration) =150
TOTAL CREDITS=05

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 analyze them using appropriate measuring instruments as well as by applying his/her knowledge of range of motion to be able to identify available prosthetic/orthotic treatment. The student should recognize that biomechanical as well as pathological factors must be viewed concurrently with anatomical factors.

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 the 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.*

Learning outcomes:

- *Develop an understanding of basic terminology*
- *Develop a concept on the interrelation of various organs and their function in human locomotion*
- *Analyze the structure and function of all systems of the human body D*
- *Develop a clear understanding of cells, tissues, organs and systems of the Human body*

- *Develop an understanding musculoskeletal system of the human body*
- *Apply conception to explain the composition, structure and categories of the bones according to their shape*
- *Understand the Principle and function of the skeletal system*
- *To gain a more complete understanding of different types of joints and describe the structure of synovial joints*

S.NO	TOPIC (Theory)= 120 Hours
1.	General Histology, Study of the basic tissues of the body; Cells, Epithelium, Connective Tissue, Cartilage, Bone, Muscular tissue, Nerve
2	Embryology: Development of bones, axial and appendicular skeleton and muscles
3	Regional anatomy: THORAX 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
4	Respiratory system: Outline of respiratory passages Pleura and lungs: position, parts, relations, blood supply and nerve supply Didiaphragm: Origin, insertion, nerve supply and action, openings in the diaphragm. Intercostal muscles and Accessory muscles of respiration: Origin, insertion, nerve supply and action.
5	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
6	Musculoskeletal 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
7	Osteology: Clavicles, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges. Soft parts**:** pectoral region, axilla, cubital fossa, palm, dorsum of hand, muscles, nerves, blood vessels. Joints: Shoulder girdle, shoulder joint, elbow joints, radioulnar joint, wrist joint and joints of the hand. Arches of hand, skin of the palm and dorsum of hand.
8	Osteology**:** Hip bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges. 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. Joints: Hip Joint, Knee joint, Ankle joint, joints of the foot.

9	Osteology**:** Cervical, thoracic, lumbar, sacral and coccygeal vertebrae and ribs Soft tissue**:** Pre and para-vertebral muscles, inter-costals muscles, anterior abdominal wall muscles, Inter-vertebral disc. The pelvic girdle and muscles of the pelvic floor
10	Osteology: Mandible and bones of the skull

S.NO	TOPIC (Practical)= 30 Hours
1.	To identify and mark the surface of the body, joint axis, and important landmarks of the human body, demonstration on model or any live model (volunteer) in the class
2	Demonstration of origin, insertion of all muscles in extremities on dissected human body or in 3-D model or in cadaver
3	Demonstration of the gross system, joints and viscera of the body
4	Demonstration of heart, kidney, lungs, Lower limbs, upper limbs, spine and brain
5	Demonstration of the complete nervous system in a dissected body or 3D model CNS and PNS
6	Demonstration of all long and short Bones of the extremities
7	Demonstration of the osseous structure of Arches of the foot, hand, skin of the palm and dorsum of the hand.
8	Demonstration of Mandible and bones of the skull

RECOMMENDEDBOOKS&JOURNALS

Sl.No.	Author	Title	Publisher	Year/Vol.
1.	Chaurasia, B D	Human Anatomy: Regional and Applied	CBS, New Delhi	January 2013, reprint 6th edition
2.	Chaurasia, B D	Handbook of General Anatomy	CBS, New Delhi	7th Edition , July 2023
3.	Field, Derek	Anatomy: Palpation and Surface Markings	Butterworth, London	1997
4.	Asim Kumar Datta	Essentials of Human Osteology	Current Books International	1997
5.	John Charles Boileau Grant, John V. Basmajian, Charles E. Slonecker	Grant's Method of Anatomy A Clinical Problem-solving Approach	Williams & Wilkins	2010
6.	Richard Lee Drake, Wayne Vogl, Adam W. M. Mitchell	Gray's Anatomy for Students	Elsevier	2019
7	Last's Anatomy: Regional and Applied	Robert M. H. McMinn MD PhD FRCS(Eng.)	Churchill Livingstone;	9th edition (19 September 1994)

TITLE- PHYSIOLOGY
COURSECODE--- BPO102
TEACHING HOURS—90 = 60 (Theory) + 30 (Practical)
CREDITS---03

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.

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*

Learning out comes:

- Develop an understanding of physiology of normal walking
- Expanding physiological knowledge to understand how the body works.
- Develop concept on interrelation of various organs and its function in both mobility and stability
- Analyze physiological function of all tissues, organ and systems of human body
- *Develop clear understanding on cell, tissue, organ and systems of Human body*
- *Develop an understanding Gait & Posture Physiology of human body*
- *Apply conception to explain composition of blood, nerve tissue, skeletal tissue and bones*
- *Understand the physiology of cartilage, ligaments, muscles and joint tissues.*
- *Understand to determine what goes wrong in disease or pathological conditions, facilitating the discovery of new diagnostics, treatments and preventative measure*

S.NO	TOPIC Theory (90 hours)
1.	General Physiology Cell: Organelles: their structure and functions, Transport Mechanisms across the cell membrane, Body fluids: Distribution, composition
2	Blood: Introduction: Composition and functions of blood, Plasma: Composition, functions. Plasma proteins. RBC: count and its variations, Hemoglobin -

	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.
3	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.
4	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
5	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
6	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, extrapyramidal 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.
7	Kidney and micturition Introduction and functional anatomy of kidney, innervation, renal circulation and care of any appliances fitting fir dysfunction. Micturition – Physiological anatomy and nervous connection of the bladder, cysto metrogram micturiton reflex.
8	Integumentary system: Structure of skin, function of skin: Protection, heat regulation, sensation and elasticity
9	Endocrinology Endocrine Pancreas: Secretory cells, action, regulation of secretion of insulin and glucagon. Glucose metabolism and its regulation. Disorder: Diabetes mellitus.
10	Nutrition & Metabolism Introduction to Nutrition and Metabolism. Factors influencing energy expenditure

	PRACTICAL (30 hours)
1	Measurements and identification of blood cells and count (RBC, WBC, ESR, TC, DC, Color index, blood group) in normal and at least in one pathological condition
2	Spirometry test, respiratory test and Vital capacity is the total of the tidal volume, inspiratory reserve volume, and expiratory reserve volume. In a normal healthy adult lung
3	Heart rate, pulse rate, pulse oxy meter, blood pressure measurement
4	Normal Cardiac response, E.C. G, PQRS graph
5	Normal skeletal Muscle electro diagnostic measurements, EMG
6	Metabolic Analyzer, Oxygen calorimetric and Physiological Cost
7	Sensory and Motor examinations and tests

RECOMMENDEDBOOKS&JOURNALS

Sl.No.	Author	Title	Publisher	Year/Vol.
1	Chatterjee, C. C.	Human Physiology	Medical Allied	1997 2V
2	Dr. A. K. Jain	Human Physiology for B.D.S and PT/OT Students		1 st Edition 1998
3	Guyton, A.C. and Hall, J. E.	Text Book of Medical Physiology	W.B.Saunders, Singapore	1998
4	ABS Mahapatra	Essentials of Medical Physiology	A.B.S	
5.	Gillian Pocock, Christopher D. Richards, David A. Richards	Human Physiology	Oxford University Press	2018

TITLE: MATERIAL SCIENCE AND P&O LAB. TECHNOLOGY
COURSECODE---BPO-103
TEACHING HOURS—90 = 60 (Theory) + 30 (Practical)
CREDITS--03

Course Description: The structure of the course has been designed to impart knowledge and skill in P&O fabrication units and labs. Different material used, their specification, testing, both physical and chemical properties, machines/tools safety and hazards.

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 behavior of these materials, along with techniques used to improve the mechanical and failure properties in terms of alteration of structural elements.
- Describe the basis for the selection of different materials for specific prosthetic and orthotic applications.
- Demonstrate knowledge of toxicity and safety issues associated with the use of specific materials.

Learning Outcomes

- Understand the fundamental concepts of materials science in the aspects of composition, specification and structure of metal, plastics, alloys, leather, fabrics, foams and strength of materials and able to solve the issues in practical engineering applications
- Learn to work and function effectively on a team within the ethics, norms and standards of safety, hazards and provide leadership, create a collaborative and inclusive environment inside the Lab
- Learn to operate all machines and tools in the Lab
- Understand do‘s and don‘ts of Machines and tools
- Develop ability to recognize ethical and professional responsibilities in difficult/different situations of fabrication and make informed judgments
- Learn to interpret material testing and conduct appropriate experimentation, analyze and interpret

data, and use specific judgment to draw conclusions

S.NO	TOPIC Theory (60 hours)
1.	**General** Introduction to bench work, Hand tools, Machineries, Introduction to common machineries for fabrication of P & O and AT devices. 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
2	Prosthetic and Orthotics Laboratory Safety & Hazards and Care
3	Fundamental of riveting, soldering, brazing and welding
4	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. Leather, types, tanning, preservation, lamination, properties and adhesives for leather. Fabric types, properties, utilization, selection and quality control 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. Different types of foams used in P&O especially Latex, Polyurethane, polyethylene and other kind of rigid/ semi rigid/ flexible foams. Plaster of Paris& Silicon and its application procedure in Prosthetic & Orthotic technique
5	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 fibre 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
	PRACTICAL 30 hours
1	Material properties testing procedure- Impact testing, strength testing, thermal properties, mechanical properties testing, Hardness Testing, Sore Testing, Universal Testing Machine and Material Simulation
2	Welding, Bending, Orthotic Joint Fixing , Wheel Seat fixing, shouldering, Brazing
3	Designing and shaping, Pattern cutting, Layout and padding

RECOMMENDED BOOKS & JOURNALS-

Sl. No.	Author	Title.	Publisher	Year/Vol
1.	Arthur W. Birley, Barry Haworth, Jim Batchelor	Physics of Plastics Processing, Properties and Materials Engineering	Hanser Publishers	1992

2.	R. C. Prasad, P. Ramakrishnan	Composites, Science, and Technology	New Age International	2000
3.	George Wypych	Handbook of Polymers	Elsevier Science	2022
4.	S. K. Garg	Comprehensive Workshop Technology (Manufacturing Processes)	Laxmi Publications	2009
5.	W. Chapman	Workshop Technology Part 1& Part 2	CRC Press	2019
6.	A. K. Haghi, Abbas Hamrang, E. Klodzinska, Gennady E. Zaikov	Material science &engineering, Volumes 1 and 2 (two Volume Set)	Apple Academic Press	2018
7.	V. H. Talib	Handbook Medical Laboratory Technology	CBS Publishers & Distributors	2019
8.	Erich Fitzer	Carbon Fibres and Their Composites	Springer Berlin Heidelberg	2012
9.		Materials Science	S. Chand Limited	2008
10.	NIIR Board of Consultants Engineers	Leather Processing & Tanning Technology Handbook	NIIR PROJECT CONSULTANCY SERVICES	2011
11.	Manas Chanda	Plastics Technology Handbook	CRC Press	2017
12.	Nigel Mills	Polymer Foams Handbook		

Journals :

- Journal of Applied Polymer Science
- Journal of Material Sciences & Engineering
- The International Journal of Advanced Manufacturing
- Journal of Prosthetics & Orthotics

TITLE-Bio-Mechanics and Kinesiology
COURSECODE---BPO 104
TEACHINGHOURS— 90 (Theory)
CREDITS---03

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 can demonstrate the rigorous application of these principles to practical P&O situations and in the analysis of those situations.

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
- Utilize temporal spatial, kinematic and kinetic information to distinguish between the normal and abnormal functions of the upper limbs, lower limbs &Spine.
- Analyzetheforcesataskeletaljointforvariousstaticanddynamicactivities
- Demonstrate the ability to analyze forces and moments applied to the body by prosthetic and orthotic devices.
- Applybiomechanicalprinciplestogenerateoptimalsolutionstoclinicalproblems in prosthetics and orthotics.
- Understand the concepts of differentiation and integration and evaluate derivatives and integrals of a function
- Introduce students to the mechanical principles that can be applied to human structure and function of human movement and the musculoskeletal system.
- To develop the basic understanding of biomechanics and kinesiology and its application in human body movements in performing activities.

- To estimate posture and human gait parameters in normal and pathological conditions.
- To explain the concept of mechanical laws govern human motion.
- Use of digital technology in measuring human gait parameters.

Learning Outcome

- Identify, analyze, and solve various biomechanical problems.
- Identify the major factors involved in the angular kinematics of human movement.
- Understand the Linear and angular kinetics of normal human locomotion.
- Ability to apply the mechanical concepts to understand human movement.
- Able to do the gait analysis of pathological gait and quantify biomechanical deficit.
- Ability to understand the mechanics of bone .joints, ligaments and soft tissue.
- To know the use of digital equipment in assessment of pathological gait.

S.NO	TOPIC
1.	**Fundamentals of Biomechanics**- Kinetics, Kinematics Statics and dynamics Types of Motion, Location of Motion, Direction of Motion, Magnitude of Motion, Definition of Forces, Force of Gravity Reaction forces, Equilibrium, Objects in Motion, Laws of Motion, Force of friction, Concurrent force systems, Parallel force systems, Work, Moment arm of force, Force components Equilibrium of levers.
2.	**Kinesiology**: Definition, Origin & development, Forms of human movement and their characteristics, Physical fitness Physical activity and sports, Motor learning and Movement intelligence, Nutrition, Health promotion and disease prevention.
3.	**Joint structure and Function:** Joint design, Materials used in human joints, General properties of connective tissues, Human joint design, Joint function, Joint motion
4.	**Biomechanics of Shoulder Complex**: Components of shoulder complex, Integrated Function of Shoulder Complex, Mobility and Stability of Shoulder Complex, Structural and Functional Dysfunctions around Shoulder Complex
5.	**Biomechanics of Elbow Complex**: Structure and function of the Elbow Complex, Structure and Function of the superior and inferior Radio-ulnar Joints, Mobility and Stability of Elbow Complex, Effect of Immobilization and Injury
6.	**Biomechanics of the Wrist and Hand Complex:** Structural components of the Wrist complex, function, structure and function of the Hand Complex, Finger Musculature, Functional Position of the Wrist and Hand.
7.	**Biomechanics of the Hip complex:** Structure and Function of the Hip Joint, Arthro kinematics and Osteo kinematics, Hip Joint Musculature, Stability, Muscle Function in Bilateral and Single leg Stance, Trabecular System, Biomechanical Alteration in various Hip joint Pathology.
8.	**Biomechanics of the Knee Complex:** Structure and Function of the Tibiofemoral Joint, Static and Dynamic stability of Tibiofemoral Joint, Structure and Function of the Patellofemoral Joint, Stability of Patella, Biomechanics changes in the Knee complex with Pathology
9.	**Biomechanics of the Ankle Complex**: Kinematics and Kinetics of the Tibiotalar Joint, Stability of the Ankle Joint, Arch of foot, Effect of weight bearing on foot
10 .	**Biomechanics of Spine:** Motions of the spine, Biomechanics of different region of spinal column, Biomechanics of Inter vertebral disk.

11	Gait: Introduction to Gait Cycle and Normal Human Locomotion.

RECOMMENDED BOOKS & JOURNALS-

Sl. no.	Author	Title	Publisher	Year/volume
1	Rose, Jessicaed.	Human walking	Lippincott Williams & Wilkins	2006
2	Soderberg, L.ed.	Kinesiology: Application to Pathological Motion	Lippincott Williams and Wilkins	1986
3	Hoffoman J. ed.	Introduction of Kinesiology, 2nd ed.	Human Kinetics	2009
4	Hamill, Joseph	Biomechanical Basis of Human Movement	Lippincott Williams & Wilkins	2015
5	D. Humphey	An Introduction to Biomechanics	Springer	2004
6	Tyldesley, Barbara	Muscles, nerves & movement, 3rd ed.	Wiley Blackwell	1996
7	Perry, Jacuelin	Gait analysis	SLACK Incorporated	2010
8	Tozeren, Aydin	Human body dynamics	Springer	2000
9	Harries, G.F.ed	Human motion analysis	I.E.E.E.Press	1996
10	Dvir, Zeevi	Clinical biomechanics	Churchill Livingstone	1996
11	Hall, Susan J	Basic Biomechanics	McGraw-Hill	2014
12	Hausdorff, Alexander,Jeffrey M, Neil	Gait disorders	McGraw-Hill	2005
13	Duane Knudson	Fundamentals of Biomechanics ,2nd ed.	B. I. Publications	2007
14	Stanley Bell,P Frank	Principles of mechanics and biomechanics	Routledge/Taylor & Francis	1999
15	Black Jonathan	Clinical Biomechanics	B. I. Publications	2001
16	Donatelli, R.A. Davis, Philadelphia	Biomechanics of the Foot and Ankle	Davis, Philadelphia	1996
17	Benno M. Nigg	Biomechanics of Musculoskelton System	Wiley/ Springer Nature	2017
18	Wagner Mechael	A D Manual of Fracture	Wiley Blackwell	2011
19	Ronal C Valmassy	Clinical Biomechanics of Lower Limb	Elsevier Health U.S	1996
20	Y. C. Fung	Biomechanics: Mechanical Properties	Elsevier Health U.S	1993
21	Fabrizio Cleri	The Physics of Living Tissue	Springer Nature	2016
22	C. Rajput	Text book of Fluid Mechanics	Springer Nature	2018
23	White & Punjabi	Biomechanics of Spine	Concept of Physics	1990

TITLE- Applied Mechanics
COURSECODE---BPO 105
TEACHING HOURS— 60 (Theory)
CREDITS:02

Course Description: This course provides a comprehensive introduction to the fundamental principles of electronics and applied mechanics. Students will learn the basic concepts, components, and circuits that form the building blocks of electronic systems. Through a combination of theoretical knowledge and practical hands-on exercises, students will gain a comprehensive understanding of basic electronic circuits and application of laws and principles in mechanical systems. Students will develop the skills to apply this in prosthetics and orthotics field

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

- 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.
- Students learn to predict the effects of force and motion and apply these insights in carrying our problem analysis, creative design, manufacture and assessment of prosthetic and orthotic devices.
- Consequences of material selection and assembly methods will be explored.
- Explain the mechanical and failure behavior of these materials, along with techniques used to improve the mechanical and failure properties in terms of alteration of structural elements.
- Learn to interpret material testing and conduct appropriate experimentation, analyze and interpret data, and use specific judgment to draw conclusions
- students will immediately see the relevance of applying engineering principles to a deeper understanding of component design, socket fit and alignment concepts
- Have an understanding of equilibrium and compatibility in relation to 2-dimensional stress and

strain and be able to apply knowledge to problems involving the analysis of stress and strain in the context of elementary design of engineering components.

- Assessment of bending and torsion in structures. Designing devices to resist dynamic loads. Sensitivity analysis, sources of error and consequences for design and analysis. Energy expenditure and impact on device design.

Learning Outcomes:

- 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.
- Describe the basis for the selection of different materials for specific prosthetic and orthotic application
- Understand the principles related to the mechanics of solids is extended to the mechanics of fluids with a view to appreciating their role in the operation of prosthetic devices such as hydraulic swing phase controls.

DETAILED CONTENTS:

S.NO	TOPIC
1.	**General Mechanics**: Definition of Mechanics, 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. Simple stress & Strain: Definition of stress and strains, factor of safety stress, modulus of elasticity, longitudinal strain and internal strains. Young‘s Modulus and Possion‘s ratio.
2	**Theories of component failure**. Fluid Mechanics and applications. Using elastic failure theories to predict failure. Calculating stress and strain in given scenarios .Understanding hydrostatics and conservation law. Calculating the flow of fluid and how this relates to prosthetic/orthotic applications
3	**Statics and Dynamics** – Scalar and vector quantities, Summing and resolving forces, The concept of equilibrium, Moments, Static equilibrium accounting for moments, Resultant force and line of action, Free body diagrams. Kinematics of rigid bodies, energy, stress and strain. Practices on parallel and non-parallel forces, torque. Linear and angular motion, uniform acceleration, friction, inertia.

4	**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. Introduction to control theory and its applications in Prosthetics and Orthotics.
5	**Control systems**: Introduction to control theory and its applications in Prosthetics and Orthotics.

RECOMMENDED BOOKS & JOURNALS:

1. R.S.Khurmi Applied Mechanics
2. Strength of Materials by R.S. Khurmi
3. Jagdish Lal Strength of Materials
4. A Textbook of Hydraulics and Fluid Mechanics by R.S. Khurmi
5. Applied Mechanics - S.K. KATARIA and SONS, Author : A.K. Upadhyay
6. Thereja, B.L. Basic electronics
7. C.D. Sensor technology handbook
8. Singh, Anokh Fundamentals of digital electronics & microprocessors
9. Ralph. W. Stach, Ph.D. Biological & Medical Electronics London.
10. Bio-electricity by .E. Svek / Ling D.E.E.
11. Mechanics of Materials Brooks Cole; 6Rev Ed edition (15 Dec 2003) ISBN-10: 0534417930
12. Hearn, EJ Mechanics of Materials: an introduction to the mechanics of elastic and plastic deformation of solids and structural materials. Butterworth Heinemann, 3rd edition (9 Jul 1997) ISBN-10: 0750632658 Benham, PP; Crawford, RJ
13. Armstrong, CG Mechanics of engineering materials Prentice Hall; 2nd edition (11 Mar 1996) ISBN-10: 0582251648 Gordon, JE The science of strong materials (or why you don‘t fall through the floor. Pelican Books. Princeton University Press; Rev Ed edition (17 Aug 2008) ISBN-10: 0691125481
14. Applied Mechanics by J Hannah & MJ Hillier, 3rd Edition, Longman Scientific & Technical, 1995 ISBN 0-582-25632 1 Fitzlaff, G, Heim S
15. A Text Book of Electrical Technology- B.L. Theraja and A.K. Theraja, S Chand & Company Ltd.
16. Fundamentals of Electric Circuits – Charles K. Alexander and Matthew N.O. Sadiku, McGraw Hill Education.
17. Principle of Electronics -V. K. Mehta, S Chand & Company Ltd.
18. Grob's Basic Electronics - Mitchel E. Schultz, McGraw-Hill.
19. Fundamentals of Electrical Engineering - Robert P. Ward, Prentice-Hall

TITLE: Electronics
COURSE CODE---BPO- 106
TEACHING HOURS- 60
CREDITS---2

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 and take over the technical projects in final year for the practical implication of the knowledge. Moreover, this subject will lay down the foundation for more advanced subject like Mechatronics in higher education.

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 and its application in myoelectric prostheses.
- Explain safety practice of electricity in P &O Lab.
- Design and apply the basic electrical circuits in the final year technical projects.

Detailed contains

S.NO	TOPIC
1	**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.
2	**Introduction to Electronics:** Signals, frequency Spectrum of Signals, Analog and Digital Signals, Linear Wave Shaping Circuits: RC LPF, Integrator, RC HPF, Differentiator. Properties of Semiconductors: Intrinsic, Extrinsic Semiconductors, Current Flow in Semiconductors, Diodes: p-n junction theory, Current-Voltage characteristics, Analysis of Diode circuits, Rectifiers, Clippers, Clampers, Special diodes
3	**Introduction to basics electronic devices:** Bipolar junction Transistor (BJTs), Field Effect Transistors (FETs), Feedback Amplifiers & Oscillators, Operational Amplifiers (OP-Amps): Ideal OP-AMP, Inverting Amplifier, Non-Inverting Amplifier. Adder, Sub tractor, Integrator, Differentiator. Basic Integrated Circuits and Microcontroller.
4	**Myo-electricity and electrodes:** Technology of metal and metal paste electrodes, the equivalent circuit between electrodes, stability, source of unwanted voltage electrode systems. Other types of myo electrodes microelectrodes, implanted electrodes, comparison with surface electrodes. Sensors, microprocessors etc. Biological Potentials, Muscle action potentials, Electro myography and Myo-electricity

5	**Electrical Safety:** Introduction to single phase and three phase supply system and voltage involved. Function of line, natural and earth in single phase system. Currentpractice 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. Introduction to basic measurement Instruments: CRO, Multimeter, Signal Generators

RECOMMENDED BOOKS & JOURNALS:

1. R.S.Khurmi Applied Mechanics
2. Strength of Materials by R.S. Khurmi
3. Jagdish Lal Strength of Materials
4. A Textbook of Hydraulics and Fluid Mechanics by R.S. Khurmi
5. Applied Mechanics - S.K. KATARIA and SONS, Author : A.K. Upadhyay
6. Thereja, B.L. Basic electronics
7. C.D. Sensor technology handbook
8. Singh, Anokh Fundamentals of digital electronics & microprocessors
9. Ralph. W. Stach, Ph.D. Biological & Medical Electronics London.
10. Bio-electricity by .E. Svek / Ling D.E.E.
11. Mechanics of Materials Brooks Cole; 6Rev Ed edition (15 Dec 2003) ISBN-10: 0534417930
12. Hearn, EJ Mechanics of Materials: an introduction to the mechanics of elastic and plastic deformation of solids and structural materials. Butterworth Heinemann, 3rd edition (9 Jul 1997) ISBN-10: 0750632658 Benham, PP; Crawford, RJ
13. Armstrong, CG Mechanics of engineering materials Prentice Hall; 2nd edition (11 Mar 1996) ISBN-10: 0582251648 Gordon, JE The science of strong materials (or why you don‘t fall through the floor. Pelican Books. Princeton University Press; Rev Ed edition (17 Aug 2008) ISBN-10: 0691125481
14. Applied Mechanics by J Hannah & MJ Hillier, 3rd Edition, Longman Scientific & Technical, 1995 ISBN 0-582-25632 1 Fitzlaff, G, Heim S
15. A Text Book of Electrical Technology- B.L. Theraja and A.K. Theraja, S Chand & Company Ltd.
16. Fundamentals of Electric Circuits – Charles K. Alexander and Matthew N.O. Sadiku, McGraw Hill Education.
17. Principle of Electronics -V. K. Mehta, S Chand & Company Ltd.
18. Grob's Basic Electronics - Mitchel E. Schultz, McGraw-Hill.
19. Fundamentals of Electrical Engineering - Robert P. Ward, Prentice-Hall

TITLE: PROSTHETIC SCIENCE-I
COURSE CODE---BPO- 107
TEACHING HOURS- 90-Theory, 240- Practical (Total-330 hours)
CREDITS---11

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.

Learning objectives:

- 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 andpathologicalgaitandusethisinformationtojustifytheselectionand 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 component.
- 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

Learning Outcome

- To develop an understanding of the compensatory mechanism of the human body and its ability to adapt itself to overcome functional deficiencies of its parts.
- To provide a frame of reference for evaluating the degree of success obtained in replacing lost functions by means of an artificial leg.
- To obtain information on the cause and possible treatment of phantom pain and other

medical problems of the amputee

- To design and prescribe best combination of components for improve fitting for better comfort and function.
- Understand measurement taking, casting of partial foot, Symes and Transtibial positive mould
- Understand biomechanical modification of partial foot, Symes and Transtibial positive mould
- Learn the procedure of fabrication of socket and procedures used in fitting and alignment of prosthesis
- Understand and apply fundamental principles to the problem of fit and alignment and to formulate the guiding principles involved.
- To develop mechanical aids to improve fit and alignment and to serve as tools to simplify lab operations.
- To investigate and evaluate types of suspension as well as materials and methods used in socket fabrication.
- To develop simplified methods of evaluating the amputee-limb combination-to be used as a check by the prosthetist, the physician and other team members.
- To improve methods of training the lower-extremity amputee in order to get better functional and more effective use of his prosthesis.

S.NO	TOPIC (Theory)-90 Hours
1.	**Introduction** – Introduction to Prosthetics, definitions of various terminologies, Historical development in Lower Extremity Prosthetics in India and abroad.
2	**Prosthetic Feet**: Classes of Various types of Prosthetic Feet
3	**Partial Foot Prostheses**: Various types of Partial foot prostheses. Biomechanics of Partial foot prosthesis, Prescription Principles, Materials used for partial foot prostheses, various casting & fabrication techniques of Partial foot prosthesis.
4	**Symes Prosthesis-** Various types of Symes Prosthesis, Prosthetic components, Prescription criteria, and Principles. Materials used for Symes prosthesis, casting techniques. Cast modification. Fabrication & alignment techniques for Symes prosthesis
5	**Trans Tibial**: Various types of trans-tibial prosthetics technology, 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 trans-tibial prosthesis. Fabrication Technique for trans-tibial Conventional Prosthesis – both Open and close-ended socket, Different types of socket designs – PTB, PTS, PTBSC, PTB-SCSP TSB etc, Different types of suspension. Alignment techniques
6	**Knee Joints:** Different types of Endoskeleton and exoskeletal knee joints -Single axis knee joints, Polycentric knee joints, Free knee, Constant friction knee joints, Variable friction Knee joints, microchip control knee, hydraulic knee joints, swing Phase control knee joints, Stance Phase control knee joints etc
7	**Hip Joints:** For above knee as well as for hip disarticulation/ hemi-pelvictomy – all types of hip joints especially single axis and Swivel type

8	**Introduction to ALIMCO and other Indian manufacturer components:** Different types of Foot, Knee, Hip Joints manufactured by ALIMCO, Parivartan Kit for Both Below Knee & above knee Prosthesis, Kadam prosthetic Knee joint, Ranger foot, Jaipur foot and others
9	Biomechanics of partial foot, and Symes Prosthesis

Reference Text Books and Journals

S. No.	Author	Title	Publisher	Year/Vol. / Edition
1.	May Bella J.	Amputations & Prosthetics	Jaypee Publisher New Delhi	1996
2.	American Academy of Orthopaedic Surgeons	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
3.	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation	Elsevier	2012
4.	Shurr. G. Donald&J.W.Michel	Prosthetics & Orthotics	Pearson; 2nd edition	2001
5.	Seymour, Ron	Prosthetics & Orthotics Lower Limb& Spine	Lippincott Williams and Wilkins	2002
6.	MathurU.N.Dhur A.P	Introduction to microprocessor	Mac-Graw Hill Inc. New Delhi	1990
7.	KevinCroll	Prosthetic &patient management	SLACK Incorporated	2006
8.	Parr, Andrew	Hydraulics and pneumatics	Jaico Publishing House	1993
9.	Bates, Andrea	Foot and ankle in sports	Mosby;	2007
10.	C.A.Hannesseg	Maintenance and care of the prosthesis	Orthotics & Prosthetics (O&P) Virtual Library	1958
11.	Miles Anderson	Manual for lower Extremity prosthetics Publisher : Mosby	Mosby publications/ or N.Y.U. St. Louice, London, Chickago	1978
12.	C.A.Melancik	Hip disarticulation Prosthesis	Prosthetic Services Centre, Department of Veterans Affairs, Toronto, Canada	1954
13.	Mark H Bussell	New Advances in Prosthetics and Orthotics	Saunders (Elsevier Health Sciences Division)	2006
14.	Andrew C. Ruoff& Others	The Immediate postoperative Prosthesis in L.E E. Amputation	JAMA Surgery	1969
15.	Charles A Frank	Congenital Limb Deficiency	PubMed	1986
16.	Zems Grim	Above Knee Amputation Prosthetic Principles &Practice	Zems Grim	1960
17.	Fred Hampton	Hemi pelvictomy Prosthesis	Fred Hampton	1964

TITLE: ORTHOTIC SCIENCE-I
COURSE CODE---BPO- 108
TEACHING HOURS- 90-Theory, 240- Practical
CREDITS---3 +08 =11

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.

Learning objectives:

- *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 kinematics 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.*
- *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.*
- *Createthefinaldesignoftheorthosisthroughmodificationofthepositivecastand/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 tramlines.*
- *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 are.*
- *Maintainaccuraterecordsofpatienttreatmentandfollowupaswellasconfidentiality 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 care giver 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.*
- *Describe the mechanics of materials and be able to apply these concepts to the design and construction of devices.*
- *Compareandcontrastthefunctionalcharacteristicsoforthoticcomponents.*
- *Formulateappropriateorthoticprescriptionsforwiderangeclinicalsituations.*
- *Understand and describe the roles of key members of the health care team and identify how they interrelate with the Prosthetist & Orthotist.*

Learning Outcomes:

- *To assess and collect information of patient/client problems associated with the body parts including socioeconomic status and remaining functions affecting locomotion*
- *Understand composition and specification of raw materials and components used in lower extremity Orthosis*
- *To design and prescribe best combination of components for improve fitting for better comfort and function.*
- *Understand shoe modifications and parts of shoe in controlling foot function*
- *Understand measurement taking, layout, casting of foot, leg, knee and hip joint*
- *Understand and apply fundamental principles to the problem of fit and alignment of orthosis and to formulate the guiding principles involved.*
- *To develop mechanical aids to improve fit and alignment and to serve as tools to simplify lab operations.*

- *Understand evidence based clinical prescriptions for the orthotic management of clients with complex lower limb presentations.*
- *Learn to Identify and explain how client characteristics (eg. physical characteristics, social, environmental and financial factors, activity level) influence orthotic prescription*
- *Ability to present a logical, evidence-based argument to justify the prescription*
- *Develop skill to communicate a strong rationale and evidence base for the development of an orthotic prescription*
- *Demonstrate competence in clinically relevant professional skills related to the provision of lower limb orthoses*
- *Learn to undertake patient interactions including assessment, fit and optimisation of orthotic devices*
- *Develop skill on the fabrication of lower limb orthotic devices using appropriate materials and technical procedures to achieve clinical goals, including the implementation of safe work practices.*

S.NO	TOPIC (Theory – 90 hrs)
1.	Introduction to Orthotics, definitions of various terminologies, History of Orthoses in India and abroad. Various materials used in Orthotics. Foot & Ankle Deformities
2	**Different types of Foot Orthoses**
3	**Pedorthics**: 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 Supramalleolar orthosis.
4	**AFO (Ankle Foot Orthosis):** Conventional AFO-, Custom made AFO (Articulated & Non articulated A.F.O & various types of ankle joints,
5	**Fabrication Techniques ;** 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 checkout procedures
6	**ALIMCO and other Indian manufacturer Orthotic Components:** Different Types of Ankle Joint,Knee, and Hip Joint. Ankle Foot Orthosis kit, Knee Ankle Foot Orthosis Kit, Hip Knee ankle Foot Orthosis Kit, materials components etc

RECOMMENDED BOOKS & JOURNALS

S. No.	Author	AAOS atlas of Orthosis and assistive devices,	Publisher	Year/Vol./ Edition
1.	Hsu, John D.	Powered LowerLimb Orthotics in Paraplegia	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.
2.	J. Hughes	Bio-mechanical basis of Orthotics Management	Charles C Thomas Publisher, Springfield	1980
3.	P.Bowker, D.N. Conde D.L.Bader, D.J.PRATT	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	Butter worthHeinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	1993
4.	Jan Bruckner and Joan Edelstein	Orthology: Pathomechanics of LowerLimb Orthotic Design	Churchill Livingstone	1981
5.	American Academy of Prosthetists & Orthotists	Orthotics Etcetera	American Academy of Orthotists and Prosthetists	1995
6.	John B Redford	New Advances in Prosthetics and Orthotics	Charles C Thomas Publisher, Springfield	3rd ed.
7.	Mark H Bussell	Functionalfracture bracing	Professional Monograph	2006
8.	Sarmiento, A.	Manual of Lower Extremity Orthotics	Springer-Verlag	1995
9.	AAOS	FOOT ORTHOSIS	Springfield	2018
10.	Kent, Wu	An Atlas of Lower Limb Orthotic Practice	Charles C Thomas Publisher, Springfield	1975
11.	D.N. Condieand S. Turner	Orthotics in functional rehabilitation of the lower limb	Williams & Wilkins	1990
12.	Nowoczenski, Deborah A.	Orthotics	Aspen Publishers	1997
13.	Edestein, Joan E.	Orthotics In Functional Rehabilitation of the LowerLimb	Jaypee Publisher New Delhi	2004
14.	Deborah A. Nawocze		Aspen Publishers	1997

TITLE—PROSTHETICS SCIENCE –I PRACTICAL
COURSE CODE--- B P O 1 5 1
TEACHING HOURS- 240 Hours
CREDITS---08

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.

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 tramlines.*
- *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.*

S.NO	TOPIC (Practical)-240 Hours
1.	Taking case history of a minimum of 02 individuals Patients (Different types of lower extremity below knee amputation cases)
2	Assessment, casting & fabrication of Partial foot prosthesis on model / mannequins
3	Fabrication of Prosthetic Feet, Partial foot modifications and filler
4	Assessment, casting & fabrication of Chopart Prosthesis on model / mannequins
5	Assessment, casting & fabrication of Symes' Prosthesis on model / mannequins
6	Assessment, casting & fabrication of Trans-tibial prosthesis on model / mannequins
7	Assessment, measurement, casting, cast modification, molding, lamination of socket, socket triming, socket trial of partial foot, symes,

RECOMMENDEDBOOKS & JOURNALS

S. No.	Author	Title	Publisher	Year/Edition
1	May, Bella J.	Amputations & Prosthetics	Jaypee Publishers, New Delhi	1996
2	American Academy of Orthopaedic Surgeons (AAOS)	Atlas for Prosthetic Rehabilitation, Surgery and Limb Deficiency	Mosby Publications (N.Y., St. Louis, London, Chicago)	5th Ed. 1996
3	Lusardi, Michelle M. & Nielsen, Caroline C.	Orthotics and Prosthetics in Rehabilitation	Elsevier (Saunders/Churchill Livingstone)	3rd Ed.2012
4	Shurr, G. Donald & Michael, J. W.	Prosthetics & Orthotics	Appleton & Lange	2nd Ed.2001
5	Seymour, Ron	Prosthetics & Orthotics: Lower Limb & Spine	Lippincott Williams & Wilkins	2002
6	Mathur, U. N. & Dhur, A. P.	Introduction to Microprocessor	McGraw-Hill Inc., New Delhi	1986
7	Croll, Kevin	Prosthetic & Patient Management	Author/Professional Monograph	1 June 2006
8	Lusardi, Michelle M. & Nielsen, Caroline C.	Orthotics and Prosthetics in Rehabilitation	Elsevier (Saunders/Churchill Livingstone)	3rd Ed.2012
9	Shurr, G. Donald & Michael, J. W.	Prosthetics & Orthotics	Appleton & Lange	2nd Ed.2001
10	Seymour, Ron	Prosthetics & Orthotics: Lower Limb & Spine	Lippincott Williams & Wilkins	2002
11	Melancik, C. A.	Hip Disarticulation Prosthesis	Charles C Thomas Publisher, Springfield	1978
12	Bussell, Mark H.	New Advances in Prosthetics and Orthotics	Charles C Thomas Publisher, Springfield	1st March 2006
13	Ruoff, Andrew C. & Others	The Immediate Postoperative Prosthesis in Lower Extremity Amputation	Charles C Thomas Publisher, Springfield	1982
14	Frank, Charles A.	Congenital Limb Deficiency	Charles A. Frank	1980
15	Grim, Zems	Above Knee Amputation: Prosthetic Principles & Practice	Zems Grim	1976
16	Hampton, Fred	Hemipelvectomy Prosthesis	Fred Hampton	1984

TITLE—ORTHOTICS SCIENCE –I PRACTICAL
COURSE CODE--- B P O 1 5 2
TEACHING HOURS- 240 Hours
CREDITS---08

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.
- 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 tramlines.
- 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.
- Understand the methodology of problem identification, problem solving in a process that includes all stake holders, with the patient / client at the centre.

S.NO	TOPIC (Practical)
1.	Taking case history of a minimum of 02 individuals/Patients
2	Assessment, Evaluation& fabrication of Different types of foot Orthoses on model/ mannequins
3	Assessment & Evaluation of Shoe modifications on model/ mannequins
4	Assessment, casting & fabrication of all types of Mechanical Ankle Joint, conventional& custom moulded (A.F.O.) on model / mannequins
5	Assessment, casting & fabrication of functional fracture Orthosis for below knee on model / mannequins
6	Assessment, casting & fabrication of KAFO/KO on model / mannequins
7	Assessment, casting & fabrication of HKAFO on model / mannequins
8	Orthoses in Lower Motor Neuron Disorders, Orthoses in Upper Motor Neuron Disorders,various types of knee Orthoses, Weight relieving orthosis, Floor reaction orthosis, Toronto Brace, Low cost Orthoses, Bilateral H.K.A.F.O, Orthoses in Arthritis, Orthoses in Fractures, Orthoses in Hemophilia, Orthoses in Progressive Muscular Dystrophy, Orthoses in Juvenile Disorders etc.

RECOMMENDED BOOKS & JOURNALS

S. No.	Author	AAOS atlas of Orthosis and assistive devices,	Publisher	Year/Vol./ Edition
1.	Hsu, John D.	Powered lower Limb Orthotics in Paraplegia	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.2008
2.	J. Hughes	Bio-mechanical basis of Orthotics Management	Charles C Thomas, Springfield, Illinois	1980
3.	P.Bowker, D.N. Conde D.L.Bader, D.J.PRATT	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	Butter worthHeinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	1993
4.	Jan Bruckner and Joan Edelstein	Orthology:Patho mechanics of lower Limb Orthotic Design	Churchill Livingstone	1981
5.	American Academy of Prosthetists Orthotists	Orthotics Etcetera	AAOP Publications, Washington DC	1995
6.	John B Redford	New Advances in Prosthetics and Orthotics	Charles C Thomas, Springfield	3rd ed. 2003
7.	Mark H Bussell	Functional fracture bracing	Author/Professional Monograph	2006
8.	Sarmiento, A.	Manual of Lower Extremity Orthotics	Springer-Verlag	Jan 1995
9.	AAOS	FOOT ORTHOSIS	Springfield	
10.	Kent, Wu	An Atlas of Lower Limb Orthotic Practice	Williams & Wilkins	1975
11.	D.N. Condieand S. Turner	Orthotics in functional rehabilitation of the lower limb	Churchill Livingstone	1st ed.
12.	Nowoczenski, Deborah A.	Orthotics	Aspen Publishers	1997
13.	Edestein, Joan E.	Orthotics in Functional Rehabilitation of the Lower Limb	Jaypee Publisher New Delhi	2004
14.	Deborah A. Nawocze	Orthotics	Aspen Publishers	1997

SECOND YEAR

TITLE: PATHOLOGY
COURSE CODE--- BPO201
TEACHING HOURS- 60
CREDITS---02

Course Description: The student should be able to describe and contrast the etiology 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.

Learning objectives:

- *Describe the basic pathological processes that under lie 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).*
- *To study and diagnosis human disease.*

Learning outcomes

- *Understand the language of disease with essential medical knowledge*
- *Understand the blood report, body fluid and its examination to report the abnormalities.*
- *Get clear insight the underline cause of human disease and its impact on functional mobility.*
- *Acquire knowledge and understand the formation of blood cells, structure, functions, and methods of estimating different parameters in disease conditions.*
- *Apply safety precautions, quality assurance, biomedical waste management.*
- *Learn the normal values of RBC, WBC and platelet and its differential count in disease.*

S.NO	TOPIC

1.	**General:** Introduction to pathology, basic mechanism of health and disease, clarification of disease.
2	**Inflammation** –Acute inflammation: features, causes, vascular and cellular events. Chronic inflammation: Causes, Types, Classification.
3	Cell Disease, Necrosis, Gangrene and hypoxia, Repair, Wound healing by primary and secondary union, factors promoting and delaying the process.
4	Hemodynamic disorders, thrombo embolic disease & shock. Ischemia, necrosis, thrombosis, embolism, Infarction, shock. Gangrene. Thromboangiitis obliterans.
5	**Neoplasia** – Definition, classification, Biological behaviour: Benign and Malignant tumors, Carcinoma and Sarcoma, principles of their spread.

6	**Hypersensitivity diseases and immunity –** A Brief overview of hypersensitivity reaction allergies & auto immune diseases.
7	**Genetic disorders**– A Brief overview of genetic diseases.
8	**Neurovascular diseases:** Outline of Cerebral-vascular disorders, Trauma to brain and spinal cord, Demyelinating diseases like Multiple Sclerosis., Degenerative diseases like Parkinson‘s, disease. Peripheral Vascular Disease, Poliomyelitis. Metabolic disorders– Diabeticmellitus-Types, Pathogenesis, Pathology, Laboratory diagnosis.
9	Disorders of blood. Constituents of blood and bone marrow, Regulation of Hematopoiesis. Anaemia: Classification, clinical features & lab diagnosis.
10	**Bone disorder/disease-** Bone cancer, Osteomyelitis, Osteopenia, Osteoporosis, Osteoarthritis, Paget‘s disease of bone, .Rickets and others
11	**Neuro-Muscle disease:** Myopathy, Muscular Dystrophy, Multiple Sclerosis, Myasthenia Gravis, Amyotrophic Lateral Sclerosis (ALS) , Charcot-Marie-Tooth disease, Myositis, including polymyositis and dermatomyositis and Peripheral neuropathy.
12	**Nervous System:** Alzheimer's disease, Bell's palsy, Cerebral palsy, Epilepsy. Motor Neuron Disease (MND), Neurofibromatosis and Parkinson's disease.

RECOMMENDED BOOKS & JOURNALS

SL NO.	AUTHOR	TITLE	PUBLISHER	YEAR/VOL
1.	Shirsh M. Kawthalkar	Essential of Clinical Pathology	Jaypee Brothers Medical Publishers	2022, 3rd Edition
2.	Ramdas Nayak	Pathology For Allied Health Sciences	Jaypee Brothers Medical Publishers	2017, 1st Edition
3.	Kumar, Abbas, Aster	Pathologic Basis Of Disease	Elsevier	2015, 9th Edition
4.	Dr. Sharwan Choudhary, Dr. Dharmaveer Sihag	Concise Text in Clinical Pathology	CBS Publishers & Distributors	2015, 9th Edition
5.	Md Tahminur Rahman Sjal, Hosne Ara TahminCharu	A Short Text Book Pathology	Jaypee	2018, 2nd Edition
6.	Robins	Basics of Pathology	Elsevier	2017, 10th Edition
7.	Dr. Harsh Mohan	Textbook of Pathology	JAYPEE	2019, 8th Edition

TITLE- PHARMACOLOGY & EMERGENCY MEDICINE
COURSE CODE--- BPO202

TEACHING HOURS—60
CREDITS---02

Course Description: The students will be able to acquire an understanding of pharmacodynamics, pharmacokinetics, principles of therapeutics and Prosthetic and Orthotic implications.

Introductory course provides the foundational knowledge needed for an Emergency Medicine rotation for clinically prepared medical students, residents, or practicing physicians. The first component involves completing the Units which provide: initial assessment.

Learning objectives.

- *Understand the basic concepts of pharmacology.*
- *Understand the pharmacology of common chemotherapeutics.*
- *Understand common antiseptics, disinfectants and insecticides.*
- *Understand drug acting on various systems of human body.*
- *Appreciate alternative systems of medicines.*
- *To acquire basic knowledge and skills of the emergency aspects of medical and surgical intervention and its application within the golden hour.*
- *To learn the Components in life saving emergency interventions and skills.*
- *Be familiar with the fundamental's methodology.*
- *Possess humanistic qualities, attitudes and behaviour necessary for the development of appropriate patient-doctor relationship.*
- *To assist and if necessary, train the communities*
- *To keep up-to-date and be familiar with all recent advances in the field of Emergency medicine.*
- *A basic diagnostic and treatment approach to common emergency department presentations.*
- *Skills on patient management and communication.*
- *An overview of common emergency diseases.*
- *Understand medical history taking and physical examination.*
- *Recognize immediate life-threatening conditions.*
- *Know patient management skills.*
- *Understand health promotion for the patient. Obtain an accurate, focused history based on the patient's chief complaint.*
- *Perform a focused physical examination based on the patient's chief complaint.*

S.NO	TOPIC
1.	**General Pharmacology:** Definitions: Pharmacology, Drug, Therapy, Sources of drugs with examples. Routes of drug administration: Oral (Enteral, Parenteral, Inhalation, (Advantages and disadvantages with the examples of drug administered). Pharmacokinetics of drugs -Absorption, Distribution, Biotransformation and Elimination of drugs with their clinical implications. Pharmacodynamics: Mechanism of action, factors modifying drug actions with examples, drug interactions, combined effects of drugs- synergism, Drug antagonism Therapeutics: Drug dosage, Principles of drug therapy, Adverse drug reactions and contraindication.
2	**Autonomic Nervous System:** Cholinergic and Anti-Cholinergic drugs, Adrenergic and Adrenergic blocking drugs, Peripheral muscle relaxants.
3	**Neuropharmacology:** 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
4	**Disorders of Movement:** Drugs used in Treatment of Parkinson‘sDisease, Antiepileptic Drugs, Spasticity and Skeletal Muscle Relaxants
5	**Inflammatory/Immune Diseases:** Non-narcotic Analgesics and Non-steroidal 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
6	**Respiratory Pharmacology:** Obstructive Airway Diseases, Drugsused in Treatment of Obstructive airway Diseases, Allergic Rhinitis
7	**Digestion and Metabolism:** Gastrointestinal Pharmacology: Peptic Ulcer Disease, Constipation, Diarrhea, **Drugs Used in Treatment of Diabetes Mellitus:** Insulin, Oral Hypoglycemics. Thyroid and anti-thyroid drugs.
8	**Geriatrics:** Pharmacology and the geriatric Population: Adverse effects of special concern in the Elderly, Dementia, Postural hypotension, urinary incontinence
9	**Cardiovascular Pharmacology:** Drugs used in the treatment of Heart failure; Anti-Hypertensive Drugs-Beta blockers, ACE Inhibitors, Calcium channel inhibitors, Alpha Blockers, Vasodilators, Drugs used in Myocardial ischemia (Heart attack)-Coronary vasodilators, Thrombolytics, anti-coagulants.
10	**Chemotherapy of infections:** definitions, classification of anti-microbial agents- Beta lactam antibiotics-Penicillin, Cephalosporins, Aminoglycosides antibiotics, Broad spectrum antibiotics-Tetracyclines, sulphonamides, anti-fungal drugs, anti-protozoal-Metronidazole, anti-malarial, anti-viral drugs, Anti-Tuberculosis
11	**Miscellaneous:** General management of drug Poison with antidotes Prevention and Drug therapy used in emergencies Seizures ,Anaphylactic shock ,Status asthmaticus ,Diabetic ketoacidosis Shock ,Cardiac arrest ,Snake bite poison ,Head injury
	EMERGENCY MEDICINE

12	Basic and advance skills of Life support systems (BLS). First aid, CPR techniques, Measuring Blood pressure, Blood sugar level, Pulse rate etc. Knowledge of G-group medicines with respect to prosthetics, orthotics, Rehabilitation science,general and National emergency. BLS in adult victims, paediatric victims, pregnant victims.
13	Management of Seizures , Poisoning , Chest pain / Heart attack Snake bite, Bee sting , Drowning Recovery position.
14	Emergency management of Scene safety, Primary assessment (ABCDE), Bleeding control/hemorrhage control , Cervical spine stabilization & cervical collar application, Care of amputated body part , Helmet removal , Extrication of victim from vehicle and safe transfer , Splinting of broken limb and Good Samaritan law. To know the details of Hospital referral procedures. Emergency Orthopaedics and wound care management Basic eye care techniques, related Gynaecological, skin and psychatric conditions during Rehabilitation procedures and Prosthetics & Orthotics (P&O) Care. Sound knowledge of radiology and ultra sound
15	**DEMONSTRATION / PRACTICAL** Trauma Life Support procedures in support of stabilization like RTA, Burn and emergency care, Earth quake, and other accident cases. Intra muscular and intra venous injection procedures, Setting and removing of drips. Drill training during emergency. Closed chest cardiac massage. Open chest cardiac massage Management of oxygen therapy and ventilators Incision and drainage of abscess, hematoma, Wound debridement Preservation of served extremities. Application and removal of splints and casts. Closed reduction of dislocated joints. Use of emergency immobilization and traction techniques

REFERENCE BOOKS:

S.No	Title	Author	Edition	Year of pub.
1.	Goodman & Gilman's The Pharmacological Basis of Therapeutics	Laurence Bruton	11th Edition	2006
2.	Goodman &Gilman's The Pharmacological Basis of Therapeutics	Laurence Brunton	12th Edition	2011
3.	Principles of Pharmacology of Basic Concept &Clinical Applications	Monson Paul L	1st Edition	1995
4.	Basic &Clinical Pharmacology	Bertram G. Katzung	11th Edition	2009
5.	Basic &Clinical Pharmacology	Bertran G Katzang, Susan B Masters Anthony J. Trearor	11th Edition	2010
6.	Basic &Clinical Pharmacology	Bertran G Katzang, Susan B Masters Anthony J. Trearor	12th Edition	2015
7.	Cardiovascular Pharmacology& Therapeutics	Bramah N. Singh etal	1st Edition	1994
8.	Rang& Dales Pharmacology	HP Rang	6th Edition	2007
9.	Rang &Dale	HP Rang, M M Dale,Jm Ritter, R J Flower	6th Edition	2007
10	Rang& Dales Pharmacology	HP Rang, M M Dale, Jm Ritter, R J Flower	7th Edition	2012
11	Principles of Pharmacology The Pathophysiologic basis of drug therapy(with scratch codes	David E Golan Armen Tashjian. Jr Ehrin J Armstron April Armstrong	3rd Edition	2012
13	Modern Pharmacology with Clinical Applications	Charles R Craig Robert E Stitzel	6th Edition	2012
14	Modern Pharmacology	Charles R Craig Robert E Stitzel	4th Edition	1994

TITLE: ORTHOPAEDICS AND AMPUTATION SURGERY
COURSE CODE---BPO-203
TEACHING HOURS-- Theory- 60
CREDITS—02

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

Learning objectives:

- *Understand different clinical conditions that may indirectly impact the patients'abilityto 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 postoperative care of the stump and stump hygiene.*
- *Describe the stump dermatology and the common skin diseases and management.*
- *Describe and fabricate the postoperative fitting in the lower extremity.*
- *Describe common surgical technique and how they may influence Prosthetics and Orthotics fit and design.*

S.NO	TOPIC
1.	**General Orthopedics**: Introduction, Principles of Orthopaedics. Common investigative procedures.
2	**Traumatology**: Fracture, definition, types, signs and symptoms and management. Subluxation/ dislocations – definition, signs and symptoms, management.
3	**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.
4	**Disease of bones and joints**- Metabolic diseases of bones, e.g. rickets, Osteomalacia, Osteopenia, Osteoporosis. gout, scurvy etc
5	**Congenital Deformities**: Outline of Torticollis, spina bifida, spinal anomalies scoliosis C.T.E.V.
6	Acquired Deformities- Scoliosis–all types, kyphosis, Lordosis, spondylosis Coxa- vara, coxa-valga and coxa magna, Otto pelvis, genu valgus, genu varum, genu recurvatum. Cervical and Lumbar Pathology, Prolapse of intervertebral disc, Spinal cord injury.

7	**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 footdeformities (Calcaneo-varus, Pes Valgus, varus, Metatarsalgia, plantar fasciitis, Anesthetic feet, Bunion toe Hallux Valgus) **Shoulder:**OutlineofRecurrentdislocation,Bicipitaltendinitisandperiarthritis. **Elbow and forearm:** Outline of Cubitusvarus and valgus, Madelung's deformity, Tennis and Golfer's 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,
8	**Specific Disorders:** Leprosy, Burns, Tumors – Benign & malignant, Tuberculosis & Perthes Disease, AVN(Full) Peripheral Nerve Injuries, Congenital anomalies Muscular Dystrophy etc. Sports injuries and their management.
9	**Amputation Surgery**: Indications/ causes, General Principles, Types of amputation, i.e., Guillotine Flap, Osteoplastic Myoplastic, Osteo-myoplastic. Individual'. Preparation for prosthesis. Ideal stump. Preoperative, operative and postoperative prosthetic management techniques in general. 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. Osseo integration and Osteogenesis imperfecta. Congenital anomalies, podiatry, burns.
10	**Overview of different Imaging Techniques** -X-ray, Sonography, CT Scan & MRI
11	Demonstration of different conditions & relevant x-ray films, how to read x-ray, how to measure the deformity x-ray, Cobbs & Rib angle measurement etc. Assessment related to P&O management.
12	Surface anatomy and osteology
13	Demonstration of amputation surgery

Reference Books and Journals

SL NO.	AUTHOR	TITLE	PUBLISHER	YEAR/VOL
1.	Adam, s	Outline of orthopaedics	Elsevier Health Sciences / Churchill Livingstone	2009
2.	Solomon, Louis	Apley's Systems of Orthopedics and Fracture	Arnold, London	1959
3.	Maheshwari, J	Essential Orthopedics	Jaypee Brothers Medical Publishers	2015
4.	Terke, Samual L.	Orthopedics: principles and their application	Lippencott, New York	1978
5.	Miroslow Vitali	Amputation & Prosthesis		

TITLE- ASSISTIVE TECHNOLOGY
COURSE CODE---BPO204
TEACHING HOURS— Theory-60
CREDITS---02

Course Description:

Students would acquire knowledge and skills about the prescription, fit and use of various types of mobility assistive products, self-care assistive products, developmental aids and molded seat required for people in need through International Classification Function (ICF) approach.

Learning objectives:

At the end of the course, students will be able to:

- Explain the prescription, fitting process and user training of commonly used mobility assistive products like crutches, walking stick, and walkers following ICF model.
- Assess and prescribe the best possible mobility solution for a wheelchair user.
- Carry out repair and maintenance of wheelchair,
- Describe various modifications in wheelchairs.
- Train users to make the best use of their wheelchair including handling, mobility skills, transfers, repairs, care & maintenance.
- Prescribe, fit and train of use of developmental aids.
- Describe the analysis of gait with the related mobility assistive products.
- Carry out select, fit, train and follow up for simple assistive devices for people with vision, hearing, communication and cognitive difficulties.

S.NO	TOPIC
1.	**Mobility Assistive products – Walking Aids** ● Walking aids: Types & Features ● White Cane, Walking Sticks-Single, Tripod, Quadripod, Crutches - Axillary, Elbow and Gutter crutches. Types of Walking Frame and their attachments. Parapodium etc. ● Prescription and fitting of walking aids ● Gait Training with various walking aids, installation/ fabrication of Parallel Bars. ● Product familiarization of ALIMCO products.
2	**Mobility Assistive Products-Wheelchair:** Manual wheelchair: Benefits of an appropriate wheelchair for a wheelchair user, Features and benefits of _sitting upright' in a 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 basic modification. Other types: Introduction: Basic orientation on a Power wheelchair, tricycle and motorized tricycle, modified two-wheelers for mobility. Robotics Arms. Product familiarization of ALIMCO products.
3	**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.
4	**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.

5	**Self-care assistive products** ● Who needs self-care assistive products ● Common problems of people in need ● Types and features of self-care devices Prescription, fitting and user training of toilet and shower chair **Other simple assistive devices**: Essential simple assistive devices for people with vision, hearing, communication and cognitive difficulties. Product familiarization of ALIMCO products.

Reference Books

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

TITLE: DIAGNOSTIC SKILLS, PHYSICAL & FUNCTIONAL ASSESSMENT
COURSE CODE---BPO- 205
TEACHING HOURS: Theory-90
CREDITS---03

COURSE DESCRIPTION:

This course designed to provide students with a deep understanding of the neurological system, physical assessment techniques, and functional evaluation methods. The course integrates principles from neuroscience, anatomy, physiology, and clinical assessment to equip students with the knowledge and skills necessary for evaluating patients with neurological disorders or injuries.

Learning Objective

- *Students should demonstrate proficiency of the structure and function of the nervous system at various levels.*
- *Students should develop critical thinking skills to formulate scientific questions.*
- *Students should understand how to construct testable hypotheses and design scientific investigations that contribute to neuroscience.*
- *Students should engage in laboratory investigations that focus on neuroscience.*
- *Students should communicate the results of scientific investigations effectively to scientific and non-scientific audiences in both oral and written form.*
- *Students should develop awareness of the philosophical, moral, and ethical issues raised by neuroscience and be able to evaluate arguments critically.*

Course Outcome:

- *Analyze and evaluate various levels of neurological conditions in patients.*
- *Differentiate between various neurological conditions.*
- *Be able to solve different neurological problems with respect to Orthotic Devices.*
- *Apply problem solving with respect to Orthotic Devices through search for neuroscience.*
- *Understand the concept of patient functional assessment and evaluation.*
- *Apply knowledge to assess disability in locomotor and neurological conditions.*

S.NO	TOPIC
1.	**Physical performance test:** Assesses multiple domains of physical function using observed performance of tasks that stimulate activities of daily living of various degrees of difficulty in PwDs and Geriatrics. Activities of Daily Living, Aerobic Capacity Balance – Vestibular, Cognition, Communication, Dexterity, Eating, Functional Mobility, Occupational Performance, Processing Speed, Upper Extremity Function
2	**Physical & functional assessment:** **Problem oriented Medical Record**-History, Concept Advantages Communication with Patient-Principle and methods and types Physical approach on the basis of functional Assessment -Musculo-skeletal system, **Neural Tension Test** - normal & abnormal findings, Neuro- Muscular System , Clinical decision-making , Rationale of plan of rehabilitation Management, Special orthopaedic tests commonly used in the clinical setting Principles & methods of assessment & variations in Testing & recording- Joint Range of Motion, Manual Muscle Testing, Muscle Tone, Coordination, Sensation,Perception & Cognition.
3	**Outcome Measurement tools:** Neck Disability Index (NDI), Tinetti Balance Assessment Tool, DASH, Functional Reach Test , Lower Extremity Functional Scale (LEFS), Berg Balance Scale , The Fugl-Meyer Assessment (FMA) ,Oswestry Disability Index (OSI)and others
4	**Disability Function Evaluation and Assessment**: Functional loss and its assessment in locomotor disability, testing tools and guidelines, Guidelines for Evaluation of Permanent Physical Impairment of Upper Limb, Lower Limb and spine.
5	**Diagnostic Skill:** Different Imaging Techniques -X-ray, Sonography, CT Scan & MRI, Complete blood count, ECG, EEG, EMG and NCV
6	Surface anatomy and osteology
7	**PRACTICAL:** Demonstration of different conditions & relevant x-ray films, how to read x-ray, how to measure the deformity x-ray, Cobbs & Rib angle measurement etc. Assessment related to P&O management

Reference Text Book

SL NO.	AUTHOR	TITLE	PUBLISHER	YEAR/VOL
1.	Mark F. Bear,Barry W. Conners. Micheal A. Paradiso	Neuroscience (Exploring The Brain)	Wolters Kluwer	4th ed 2025
2.	Estdmih Mtui,GregoryGruener, Peter Dockery	Clinical Neuroanatomy and Neuroscience	Estomih Mtui, Gregory Gruener, Peter Dockery	7the d.
3.	Valerie Hedges,PH.D.	Introduction to Neuroscience		
4.	Marie T. Banich, Rebecca J. Compton	Cognitive Neuroscience	Cambridge University Press	4th ed.2018
5.	Casey Henley, Phd	Foundation of Neuroscience	Michigan State University Open Educational Resources	1st ed 2021
6.	Sharon S. Dittmar,Glen E. Greaham	Functional Assessment and Outcome Measures for the Rehabilitation Health Professional	Pro Ed.	1st Jan 2005
7.	Susan B. O'Sullivan,Thomas j. Scmhmitz	Physical Rehabilitation	Jaypee	7th ed.2019
8.	Nikhil Mathur	Basics of Functional Outcome and Measurements Scales	Scientific Publisher	22ed Fed. 2013
9.	David J. Magee	Orthopedic Physical Assessment	Elsevier	6th ed.2014
10.	Keith Storey Robert H. Horner Jeffrey R. Sprague	Functional Asessment and Program Development for problem behaviour (a practical handbook)	Cengage Learning	3rd ed.2014

TITLE—PROSTHETICS SCIENCE -II
COURSE CODE---BPO 206
TEACHING HOURS- Theory- 90 + Practical -210=300
CREDITS---03+07=10

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:

- *Demonstrate empathy between Prosthetics 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 Prosthetic 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 Prosthetic 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.*

SL No	TOPIC
1	**Through Knee Prosthesis**: Various types of through knee prosthesis-Through knee prosthetic Components. Materials used for through knee prosthesis. Casting, modification and fabrication techniques for through knee prosthesis
2	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 TransFemoral socket.Various types of suspension used in Trans Femoral Prosthesis
3	**Upper Limb:** Grasp patterns, grasp forces, mechanical replacement of hand function, augmentation of deficient and function, upper limb prosthetic socket biomechanics –all types
4	**Control systems:** Introduction to control theory, application in Prosthetics of functional electrical stimulation (FES), myoelectric and bio-feedback
5	**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
6	**Partial Hand**: passive, cosmetics and functional types which also include silicon prostheses. Cosmetic hand gloves and fingers. Devices for augmentation of function and cosmesis for partial hand amputation and finger amputation
7	**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 doffing techniques. Checkout procedures, Testing and Training
8	**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. Checkout procedures, Testing and Training
9	**Trans Humeral:** 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. Checkout procedures, Testing and Training
10	**Shoulder Disarticulation**: Prescription Criteria, Types of prosthesis both cosmetic and functional, Components, Different types of Elbow and Shoulder Mechanisms. Types of Sockets, Clinical Considerations, Casting and measurement techniques, Cast modifications, Fabrication techniques, alignment techniques, Harnessing and suspension mechanisms, Control system – body powered and externally powered

.

Reference Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol ./ Edition
1	American Academy of Orthopedic Surgeons	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5TH ed.
2	Shurr. G. Donald &J.W.Michel	Prosthetics & Orthotics	Appleton & Lange	2nd ed.
3	C.A.Hannesseg	Maintenance and care of the prosthesis		
4	William R.SANTASHI Edn	Manual for Upper Extremity Prosthesis	U.S. Government / Prosthetics Education Series	1952
5	AmericanAcademy of Prosthetists&Orthoti s Ts	Powered upper limb prosthesis		
6	Mark H Bussell	New Advances in Prosthetics and Orthotics		
7	E.F.Murphy	Principal in Prosthetic management for Multiple handicapped		
8	Seymour, Ron	Prosthetics & Orthotics Lower Limb& Spine	Lippincott Williams & Wilkins	14 feb. 2002

TITLE—ORTHOTIC SCIENCE -II
COURSE CODE---BPO 207
TEACHING HOURS- Theory- 120 + Practical -330=450
CREDITS---04+11=15

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.

Learning objectives:

- *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 kinematics 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.*

S.NO	TOPIC
1.	Prescription principles of various types of Knee Orthoses (KO), Knee Ankle Foot Orthoses (KAFO),Hip Knee Ankle foot Orthoses (HKAFO).
2	**Hip Orthotics:** Orthoses for sports injury, Reciprocating Gait Orthoses (RGO), Hip Guidance Orthoses(HGO), Fracture Cast Bracing, Swivel walker, orthopodium/ Parapodium.Weightrelievingorthoses,ExtensionorthosesorOrtho-prostheses, PTB. Orthoses Orthotic management of Rickets and Knee Arthritis
3	**Control systems:** Introduction to control theory, application of Functional Electrical Stimulation (FES) in Orthotics, hybrid Orthosis
4	**Upper Limb Orthotics:** Objectives of splinting and principles. Introduction to Types & classification of Orthoses. Biomechanical principle of all types of upper limb Orthotics. The 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 orthoses. 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. Orthotic management of rheumatic arthritis and burns etc.
5	Introduction to Immobilization/ mobilization, Appliances for flail elbows: Measurement/casting and Fabrication of Shoulder Orthoses, shoulder joint braces and splints, Abduction splints and braces, Traction splints 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
6	Upper Limb: Orthosis biomechanics, application of external power, myoelectric control of external power and usage of devices
7.	Spine: Introduction to Spinal Orthosis and its classification, Design & development techniques

Reference Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol./ Edition
1	Hsu, John D.	AAOS atlas of Orthosis and assistive devices,	Mosbypublicati ons/ orN.Y.U.St.Loi, London,Chickg o	5th ed.2008
2	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation	Saunders / Elsevier	3rd ed.
3	Deborah A. Nawocze	Orthotics In Functional Rehabilitati on of the Lower Limb	Churchill Livingstone	10th aprl,1997
4	Fess,Gettle,Ph ilips ElaineEwing,K aranS, Cynthia A	Hand and Upper Extremity Splinting: principles and methods	Elsevier Mosby St. Luis B. I. Publications P	3rd ed.2005
5	Anderson, Miles H.	Upper ExtremityOrthot ics	Jaypee Publisher New Delhi	1st Dec 1979
6	Shurr. G. Donald&J.W.M ichel	Prosthetics & Orthotics	Appleton & Lange	2nd ed.1990
7	Edestein, Joan E.	Orthotics	Jaypee Publisher New Delhi	1st jan 2004
8	Mark H Bussell	New Advances in Prosthetics and Orthotics	Philadelphia : Saunders	2006
9	Jan Bruckner and Joan Edelstein	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	SLACK Incorporated	,2003
10	KentonD.Leath erman Rober A. Dickson	The Management of Spinal deformities	Butter worthHeinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	1988
11	Seymour, Ron	Prosthetics & Orthotics LowerLimb& Spine	Lippincott Williams & Wilkins	2002

TITLE—PROSTHETICS SCIENCE -II PRACTICAL
COURSE CODE--- BPO 251
TEACHIN GHOURS- 210
CREDITS---07

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.

Learning objectives:

- *Assess the medical condition of a patient related to their 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 patients' 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 tramlines.*
- *Identify problems related to device fit and/or alignment and be able to suggest and implement appropriate corrections.*
- *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 patients, 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/patient family or caregiver on the use, care, and function of the device.*
- *Understand the methodology of problem identification, problem-solving in a process that includes all stakeholders, with the patient at the centre*

S.NO	TOPIC
1.	Taking case history of a minimum of 04 individuals Patients (Different types of lower extremity amputation cases)
2	Fabrication techniques for custom devices, Advancements in manufacturing technologies, Fitting techniques for orthotic and prosthetic devices, Alignment considerations and adjustments, Socket Design and Modification, Socket design for prosthetic devices, Modification techniques for optimal fit and function, Overview of the latest advancements in ortho-prosthetic devices.
3	Assessment, casting & fabrication of Partial hand prosthesis on model/ mannequins
4	Assessment, casting & fabrication of Wrist disarticulation Prosthesis on model/ mannequins
5	Assessment, casting & fabrication of different levels of trans humeral prosthesis on model/ mannequins
6	Assessment, casting & fabrication of different levels of shoulder disarticulation prosthesis on model/ mannequins
7	Assessment, casting & fabrication of Knee disarticulation and Transfemoral prosthesis on model/ mannequins
8	Case Study

Reference Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol./ Edition
1	American Academy of Orthopaedic Surgeons	Atlas for prosthetic rehabilitation, Surgery and limb deficiency.	Mosby publications	5TH ed.
2	Shurr. G. Donald&J.W.Michel	Prosthetics & Orthotics	Appleton & Lange	2nd ed.1990
3	C.A.Hannesseg	Maintenance and care of the prosthesis		
4	William R.SANTASHI Edn	Manualfor Upper Extremity Prosthesis	U.S. Government Printing Office / Army Medical Service	1952
5	American Academy of Prosthetists &Orthotists	Powered upper Limb prosthesis	American Academy of Orthotists and Prosthetists (AAOP)	1980
6	Mark H Bussell	New Advances in Prosthetics and Orthotics	Saunders	2006
7	E.F.Murphy	Principal in Prosthetic management for Multiple handicapped	Charles C. Thomas Publisher	1971
8	Seymour, Ron	Prosthetics & Orthotics Lower Limb & Spine	Lippincott Williams & Wilkins	14 feb.2002

TITLE- ORTHOTICS SCIENCE -II PRACTICAL
COURSE CODE---BPO252
TEACHING HOURS- 330 , Practical
CREDITS---11

Course Description: This practical course aims to equip students with the skills and competencies necessary to effectively assess, fabricate, fit, and evaluate orthotic devices for individuals with musculoskeletal or neurological conditions affecting the upper and lower extremities.

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 patients' 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 tramlines.*
- *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 patient 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 at the center.*

S.NO	TOPIC
1.	Taking case history of a minimum of 04 individuals / Patients
2	Tracing and lay out of different types of Knee orthosis, KAFO & HKAFO on model/ mannequins
3	Tracing and lay out of different types of Wrist Hand Orthosis on model/ mannequins
4	Tracing and lay out of different types of Elbow and Shoulder Orthosis on model/ mannequins
5	Tracing and lay out of different types of SEWHO on model/ mannequins
6	Assessment and fabrication of Dynamics Orthosis using different passive and active materials on model/ mannequins
7	Assessment and fabrication of Dynamics Orthosis using different muscle-controlled EMG and Neuro prosthesis on model/ mannequins
9	Assessment, Evaluation & designing of Different types of upper and lower limb orthosis on model / patients on model/ mannequins
10	Assessment, Evaluation & designing of Different types of spinal orthosis on model / patients on model/ mannequins

Reference Text Book and Journals

S. No.	Author	Title	Publisher	Year/Vol./ Edition
1	Hsu, John D.	AAOS atlas of Orthosis and assistive devices,	Mosby publications/ or N.Y.U. St.Louice, London, Chickago	5th ed.2008
2	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation	Saunders / Elsevie	3rd ed. 2012
3	Deborah A. Nawocze	Orthotics InFunctionalRehabilitation of the LowerLimb	Churchill Livingstone	10th aprl,1997
4	Fess,Gettle,Philip s ElaineEwing,Kara nS, Cynthia A	Hand and Upper Extremity Splinting : principles and methods	Elsevier Mosby St. Luis B. I. Publications P	3rd ed.2005
5	Anderson, Miles H.	Upper Extremity Orthotics	Jaypee Publisher New Delhi	1979
6	Shurr. G. Donald&J.W.Mic hel	Prosthetics & Orthotics	Appleton & Lange	2nd ed.
7	Edestein, Joan E.	Orthotics	Jaypee Publisher New Delhi	2004
8	Mark H Bussell	New Advances in Prosthetics and Orthotics	Saunders	2006
9	Jan Bruckner and Joan Edelstein	Orthotics: Individual: A Comprehensive Interactive Tutorial CD-ROM	SLACK Incorporated	2003
10	KentonD.Leather man Rober A. Dickson	The Management of Spinal deformities	Butter worthHeinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	1988
11	Seymour, Ron	Prosthetics & Orthotics LowerLimb& Spine	Lippincott Williams & Wilkins	2002

TITLE- ASSISTIVE TECHNOLOGY PRACTICAL
COURSE CODE--- BPO 253
TEACHING HOURS- 90
CREDITS --- 03

Description: Students would acquire practical skills on the provision of assistive products related to mobility & self-care following the four steps as per World Health Organization (WHO) guidelines and available instruction in an open access online platform.

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

- Assessing a wheelchair user to identify the best possible mobility solution.
- Providing a manual wheelchair with an appropriate cushion.
- Problem solving to identify simple modifications to the wheelchair that can help to ensure the best fit.
- Training of wheelchair users to make the best use of their wheelchair; Carrying out follow up.
- Carry out basic wheelchair repair and maintenance.
- How to fabricate a foam contoured cushion.
- Assess, prescribe, fit and train the user on commonly used walking aids like crutches, walking, stick, walkers and self-care devices including toilet chairs and shower chairs.
- Describe the analysis of gait with the related to walking aids.
- Explain the prescription of commonly used mobility aids.
- Assess, prescribe and fabricate different types of developmental aids followed by fitting and train the care givers on its usage.

PRACTICAL

1. Practice 8 steps of wheelchair service delivery and carry out simple modifications in wheelchair with live models
2. Practice on provision of walking aids commonly used through role play.
3. Practice on assessment, prescription and fabrication of various types of developmental aids
4. Design various types of adaptive devices and practice on provision of toilet chairs
5. Taking case history of a minimum of 02 individuals / Patients

THIRD YEAR

TITLE- Research Methodology & Biostatistics
COURSECODE--- BPO301
TEACHIN GHOURS- 60
CREDITS--- 02

Course description: This Course is designed to acquire the knowledge of the research problem, design, Sampling, data collection, analysis of data, testing hypotheses, interpretation and report writing.

Learning objectives:

- Explain the process, types, design, needs, and 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, and 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 to solve a clinical problem.

S.NO	TOPIC
1.	**Introduction & Biostatistics**: Definition–Statistics, Biostatistics, Branches of statistics and its importance in health science. Variable – Qualitative & Quantitative, Discrete and continuous. Tabulation of data, Tabular Presentation of Data – Statistical Table, Format of a Table. Frequency Distribution – construction of Frequency Distribution, cumulative and relative frequency distribution, Exclusive and inclusive method of classification of Data. Diagrammatic Presentation of Data: Bar diagrams, Pie Diagram, Line Diagram, pictogram, Cartogram or Statistical map. Graphical representation of a Frequency distribution– Histogram, Frequency Polygon, Frequency curve, ogives or cumulative frequency curves. Measure of Central Tendency. Definition and calculation of mean, median, mode. Comparison of mean, median and mode. Measures of Dispersion, Definition and calculation of Range, Variance and Standard deviation. Probability and Standard Distributions- Meaning of probability of standard distribution, The binominal distribution, The normal distribution, Divergence from normality – skewness, kurtosis. Statistical Significance. Parametric tests: - t test, Non parametric tests: - chi square test, Mann Whitney U test, Z test, Wilcoxon's matched pair test. Analysis of variance & covariance - Basic principle of Analysis of Variance ANOVA and Analysis of Co variance (ANCOVA

2	**Research methodology:** Introduction to Research Methodology: Meaning of research, objectives of research, Types of research & research approaches, Criteria for good research
3	**Research Problem: Statement** of research problem Statement of purpose and objectives of research problem, Necessity of defining the problem
4	**Research design:** Meaning of research design, Need for research design, Features for good design, Different research designs, and basic principles of research design.
5	**Sampling Design:** Criteria for selecting sampling procedure, steps in sampling design, characteristics of good sample design, Different types of sample design and its features.
6	**Measurement & scaling techniques:** Measurement in research- Measurement scales, sources measurement, Meaning of scaling, its classification. Important scaling techniques.
7	**Methods of data collection:** primary and secondary data collection, its advantages and disadvantages
8	**Analysis of data:** Types of analysis
9	**Testing of hypothesis:** What is a hypothesis? Basic concepts concerning testing of hypothesis and procedure of hypothesis testing
10	**Publication & Research ethics** Importance of publication, the philosophy of science and ethics, research integrity and publication ethics, research misconduct and predatory publication.

Reference Text Book and Journals

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	Ranjit Kumar	Research Methodology A Step-by-Step Guide for Beginners	SAGE Publications	2010
2.	Carolyn Hicks	Research Methods for Clinical Therapists Applied Project Design and Analysis	Churchill Livingstone/Elsevier	2009
3.	Elizabeth Domholdt	Physical Therapy Research Principles and Applications	Saunders	2000
4.	Uwe Flick	Introducing Research Methodology A Beginner's Guide to Doing a Research Project	SAGE Publications	2014
5.	C. R. Kothari	Research Methodology Methods and Techniques	New Age International (P) Limited	2004
6.	World Health Organization	International Classification of Functioning, Disability and Health ICF.	World Health Organization	2001
7.	Adil E. Shamoo, David B. Resnik	Responsible Conduct of Research	Oxford University Press	2009
8.	Allan J. Kimmel	Ethical Issues in Behavioral Research Basic and Applied Perspectives	Wiley	2009
9.	Andy Field, Graham Hole	How to Design and Report Experiments	SAGE Publications	2002
10.	Tiffany Bergin	An Introduction to Data Analysis Quantitative, Qualitative and Mixed Methods	SAGE Publications	2018

TITLE- CLINICAL BIOMECHANICS, GAIT & POSTURE ANALYSIS
COURSE CODE--- BPO-302
TEACHING HOURS---90
CREDITS --- 03

Course Description: The course is designed to understand the Bio-mechanical principles of Prosthetics and Orthotics 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.

Learning objectives:

- Demonstrate an ability to apply principles of tissue mechanics to explain the principles of P&Otreatment, (involving various force systems) and the practical problems encountered in prosthetics and orthotics
- Use biomechanical terminology to describe the 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 functions of the upper limbs, lower limbs & Spine.
- Analyse the forces at a skeletal joint for various static and dynamic activities.
- Demonstrate the ability to analyse forces and moments applied to the body by prosthetic and orthotic devices.
- Apply biomechanical principles to generate optimal solutions to clinical problems in prosthetics and orthotics.
- Understand the concepts of differentiation and integration and evaluate derivatives and integrals of a function.
- Explain the use of various outcome measures tools and equipment in clinical practice.

DETAILED CONTENTS

S.NO	TOPIC
1.	**Posture & Gait:**Demonstrate knowledge of normal and pathological gait, including its general features, initiation, kinematics, kinetics, and energy requirements. Gain an introduction to EMG studies and the recording of electromyography**.**
2	**Tissue Mechanics:**Understand the mechanical characteristics and functions of bones, skin, ligaments, cartilage, and muscles, with the ability to analyze their mechanical properties.
3	**Joint Force Analysis**: Body segment parameters, joint forces during wing and stance phase, Qualitative and quantitative force analysis of foot and ankle joint, knee joint and Hip joint

4	**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.
5.	**Transtibial Prosthesis Biomechanics and gait analysis: S**ocket biomechanics and alignment techniques and gait analysis
6	**Through knee Biomechanics:** Through knee Prescription Principles, socket biomechanics and alignment techniques and gait analysis
7	**Trans Femoral Prosthetics Biomechanics**: General Socket biomechanics, Trans Femoral socket biomechanics and analysis of socket forces. Analysis of Trans Femoral Prosthetic gait and linkage mechanism.
8	**Gait deviation:** Gait deviation while using while using Foot Orthoses (FO), Ankle Foot Orthoses (AFO) and trans-tibial prostheses
9	**Orthotics Biomechanics:** Biomechanical principals of various kinds of above knee Orthoses 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
10	**Through Hip Biomechanics:** Socket Principles, socket biomechanics and alignment techniques and gait analysis
11	**Outcome measures tools and equipment:** introduction, classification and clinical utility of outcome measures

Text Books and Journals

Sl. No.	Author	Title	Publisher	Year/Vol.
1	Rose, Jessicaed.	Human walking	Williams & Wilkins (Baltimore)	1994
2	Soderberg, L.ed.	Kinesiology: Application to Pathological Motion	Lippincott Williams and Wilkins	1986
3	Hoffoman J. ed.	Introduction of Kinesiology, 2nd ed.	Human Kinetics Publishers	2009
4	Hamill, Joseph	Biomechanical Basis of Human Movement	Lippincott Williams & Wilkins	1999
5	D. Humphey	An Introduction to Biomechanics	Springe	2002
6	Tyldesley, Barbara	Muscles, nerves & movement, 3rd ed.	Wiley Blackwell	1996
7	Perry, Jacuelin	Gait analysis	SLACK Incorporated	2010
8	Tozeren, Aydin	Human body dynamics	Springer	2000
9	Harries, G.F.ed	Human motion analysis	Institute of Physics Publishing	1999
10	Dvir, Zeevi	Clinical biomechanics	Churchill Livingstone / Elsevier	2008
11	Hall, Susan J	Basic Biomechanics	McGraw-Hill	2011
12	Hausdorff, Alexander,Jeffrey M, Neil	Gait disorders	McGraw-Hill	2009

13	Duane Knudson	Fundamentals of Biomechanics ,2nd ed.	B. I. Publications	2007
14	Stanley Bell,P Frank	Principles of mechanics and biomechanics	Cambridge University Press	1986
15	Black Jonathan	Clinical Biomechanics	B. I. Publications	1999
16	Donatelli, R.A. Davis, Philadelphia	Biomechanics of the Foot and Ankle	Davis, Philadelphia	1996
17	Benno M. Nigg	Biomechanics of Musculoskelton System	Springer Nature	1999
18	Wagner Mechael	A D Manual of Fracture	Wiley Blackwell	2006
19	Ronal C Valmassy	Clinical Biomechanics of Lower Limb	Elsevier Health U.S	1996
20	Y. C. Fung	Biomechanics: Mechanical Properties	Elsevier Health U.S	1993
21	Fabrizio Cleri	The Physics of Living Tissue	Springer Nature	2016
22	C. Rajput	Text book of Fluid Mechanics	Springer Nature	2005
23	White & Punjabi	Biomechanics of Spine	Lippincott Williams & Wilkins	1990
24	Pamela K. Levangie Cynthia C. Norkin	Joint structure and Function	Fifth Edition	2011

TITLE ----PUBLIC HEALTH AND REHABILITATION
COURSE CODE---BPO 303
TEACHING HOURS:90
CREDITS:03

Course Description: This course explores the intersection of public health and rehabilitation, focusing on strategies and interventions aimed at promoting health and well-being among individuals with disabilities. Students will gain a comprehensive understanding of the principles, policies, and practices that contribute to effective public health initiatives in the context of rehabilitation.

Learning objectives:

- Principles of public health and their application in promoting health and preventing disabilities.
- Demonstrate an understanding of the population-based approach to healthcare.
- Use epidemiological data to inform public health strategies for individuals with disabilities.
- Analyses the impact of social determinants of health on individuals with disabilities.
- Develop advocacy skills to promote inclusive and accessible environments.
- Identify and address health disparities and inequities in vulnerable populations.
- Identify and address ethical considerations in public health and rehabilitation practice.

- Demonstrate cultural competence in working with diverse populations and respecting individual differences.
- Develop skills in conveying public health messages to a broad audience.
- Develop problem-solving and critical thinking skills in addressing public health challenges related to rehabilitation.
- Communicate effectively with individuals with disabilities, healthcare professionals, and diverse community stakeholders.

DETAILED CONTENTS

S.NO	TOPIC
1.	**Community-Based Rehabilitation (CBR) & Institutional Based Rehabilitation (IBR):** Community Based Rehabilitation: CBR and its need – difference between IBR and CBR, Different approaches in Community Based Rehabilitation (such as single disability, multi disability, and single sectorial, and multi sectorial approaches.) , Community Based Rehabilitation strategies- steps in safe guarding the rights of persons with disabilities, Community Based Rehabilitation for different socio cultural and economic conditions such as urban, rural, tribal, hilly regions, Simple knowledge about other disabilities, its prevention and its management, Role of P&O Professionals in CBR, Role of other professionals in CBR, How to work as a team in CBR/IBR structure, Simple techniques to make CBR activities more purposeful, Telemedicine
2	**Health Care System and Rehabilitation:** 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. Rehabilitation team
3	**Legislation and Acts**: RPWD act, The Mental health act, The rehabilitation Council of India act and other related act such as The National trust for welfare of persons with disabilities
4	**Schemes and Agencies: Schemes and Agencies-** Benefits/concessions State/Central, Schemes/Programs/CSR activities PMAGY,NAREGA,DDRS,SIPDA, CDEIC, ADIP & ICDS and other disability schemes, Microcredit Groups/SHG's/NHFDC, service providing agencies govt/non govt
5	**Disability Evaluation and Early Intervention:** Disability and its types, 21 disabilities, Principles of Disability Assessment, Testing Tools and Guidelines, Procedure for Certification of Multiple
	Disabilities, Guidelines for Evaluation of Permanent Physical Impairment
6	**Early Identification and Intervention, Early Identification** – Screening at PHC level, hospital, community. Rural Health Mission
7	**Barrier free aspects -inclusive environment-** Barriers in the physical and social environments. Attitudinal barriers, Concept of Empowerment envisaged under UNCRPD, Role of social network in empowerment, Universal Design – inclusive environment

8	**Therapeutic Exercises** Principle, classification, techniques, physiological & therapeutic effects, indications & contraindications of therapeutic exercises. Assessment & evaluation of a patient (region wise) to plan a therapeutic exercise program. **Joint Mobility** – Etiogenesis of Joint stiffness, general techniques of mobilization, effects, indications, contraindications & precautions. **Muscle Insufficiency** – Etiogenesis of muscle insufficiency (strength, tone, power, endurance & volume), general techniques of strengthening, effects, indication, contraindications & precautions. **Neuromuscular Inco-ordination** – Review normal neuromuscular coordination, Etiogenesis of neuromuscular in co-ordination & general therapeutic techniques, effects, indications, contraindications & precautions. Functional re-education – General therapeutic techniques to re-educate ADL function.
9	**Hydrotherapy:** Basic principles of fluid mechanics, as they relate to hydrotherapy. Physiological & therapeutic effects of hydrotherapy, including joint mobility muscle. Strengthening & wound care etc. Types of Hydrotherapy equipment, indications, contraindications, operation skills & patient preparation. Introduction to special mobilization & manipulation techniques, effects, indications & contraindications Conceptual framework, principle of Proprioceptive Neuromuscular Facilitation (PNF) techniques, including indications, therapeutic effects and precautions. Principles of traction, physiological & therapeutic effects classification, types, indications, contraindications, techniques of application, operational skills & precautions. Review normal breathing mechanism, types, techniques, indications, contraindications, therapeutic effects & precautions of breathing exercises.
10	**Group Therapy –**Review of Neuro muscular Physiology including effects of electrical stimulation. Physiological responses to heat gain or loss on various tissues of the body. Therapeutic effects of heat, cold and electrical currents. Physical principles of Electro – magnetic radiation. Electro – diagnosis – Instrumentation, definition & basic techniques of E.M.G. and Nerve Conduction Velocity **Bio–feedback** – Instrumentation, principles, therapeutic effects, indications, contraindications, limitations, precautions, operational skills and patient preparation.

Reference Text Book and Journals

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	World Health Organization	Community-based Rehabilitation CBR Guidelines · Volumes 1-7	World Health Organization	2013
2.	Bernard J. Healey, Tina Marie Evans	Introduction to Health Care Services: Foundations and Challenges	Wiley	2014
3.	Helga Anneliese Hildegard Rowe	Early Identification and Intervention A Handbook for Teachers and School Counsellors	Australian Council for Educational Research	2011

4.	Jack P. Shonkoff, Samuel J. Meisels	Handbook of Early Childhood Intervention	Cambridge University Press	2000
5.	Rumi Ahmed	Rights of Persons with Disability in India	White Falcon Publishing Solutions LLP	2015
6.	Giuseppe Palmisano, Rachele Cera, Valentina Della Fina	The United Nations Convention on the Rights of Persons with Disabilities A Commentary	Springer International Publishing	2017
7.	Department of Empowerment of Persons with Disabilities	Manual of different act for persons with disabilities in India	Department of Empowerment of Persons with Disabilities	
8.	K. Park	Park's Textbook of Preventive and Social Medicine	Bhanot Publishers	2017
9.	Michael A. Pagliarulo	Introduction to Physical Therapy- E-BOOK	Mosby	2007
10.	Vincent M. Conroy, Brian N. Murray Jr., Quinn T. Alexopulos, Jordan McCreary	Kendall's Muscles Testing and Function with Posture and Pain	Wolters Kluwer Health	2022
11.	Stuart B. Porter	Tidy's Physiotherapy	Elsevier	2013
12.	Dillon Graham	Principles of Exercise Therapy	Syrawood Publishing House	
13.	Virginia Brabender	Introduction to Group Therapy ·	Wiley	2002
14.	Dillon Graham	Principles of Exercise Therapy	Syrawood Publishing House	
15.	Vincent M. Conroy, Brian N. Murray Jr., Quinn T. Alexopulos, Jordan McCreary	Kendall's Muscles Testing and Function with Posture and Pain	Wolters Kluwer Health	2022
16.	Carol A. Oatis	Kinesiology The Mechanics and Pathomechanics of Human Movement	Lippincott Williams & Wilkins	2009
17.	Heidi McHugh Pendleton, Winifred Schultz-Krohn	Pedretti's Occupational Therapy Practice Skills for Physical Dysfunction	Elsevier	2018

TITLE- Clinical Orthotics Practice in Spinal pathologies and Disorder
COURSE CODE--- BPO 304
TEACHING HOURS- THEORY-60, PRACTICAL-240 = 300
CREDITS --- 10

Course Description: This course is designed for prosthetic and orthotic students, with specialized knowledge and skills related to the management of spinal pathologies and disorders. Participants will explore the application of orthotic interventions in the context of spinal conditions, with a focus on assessment, prescription, design, fabrication and appropriate application on specific spinal alignment with comprehensive management

Learning Objectives:

- Understand Spinal Pathologies
- Impact of spinal conditions on mobility, function, and quality of life
- Analyze the biomechanics of the spine and its role in various spinal pathologies.
- Relate biomechanical principles to the design and function of orthotic devices for spinal support.
- Evaluate materials and design considerations for spinal orthoses
- Apply appropriate clinical assessment techniques for individuals with spinal disorders
- Develop treatment plans that incorporate orthotic interventions for spinal conditions.
- Modify orthotic interventions to meet the developmental and age-specific needs of patients.
- Adhere to legal standards and responsibilities when providing orthotic services for spinal conditions.
- Engage in networking and collaboration with professionals in the spinal rehabilitation community.

DETAILED CONTENTS

S.NO	TOPIC
1.	**Introduction to Spinal Pathologies:** Overview of common spinal pathologies and disorders, Epidemiology and demographics of spinal conditions. Congenital and acquired disorders – Patho- mechanics, Clinical Features and Treatment
2	**Biomechanics of the spine** and its role in various spinal pathologies. Spinal Cord Injuries – Mechanism of Injury signs & Symptoms investigations including Electro diagnosis, splinting, implant bracing and Rehabilitation.

3	**Cervical Orthoses**: Principle, material, measurement/casting, fabrication of 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
4	**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 Immobilizers, Fitting, donning and doffing techniques. Checkout procedures, Testing and Training
5	**Lumbo sacral Orthoses:** Principle, material, measurement/ casting, fabrication of all types of Lumbosacral orthoses (LSO) especially Lordosis and scoliosis. Pelvic traction and its uses. Cranial Orthoses Orthotic management of spinal deformities/injuries. Orthotic management of Pott'sspine
6	**Sacral and coccyx orthosis**
7	**Orthosis for Spinal pain:** Pathophysiology and orthotic Treatment recommendations. Cervical region: Types of Cervical Orthosis . Biomechanical principles of cervical orthosis in pain and other conditions, Motion restriction, Unloading of spinal column, Side effect and other consideration, Outcome studies and effectiveness of cervical orthosis Lumbar pain: WISS orthosis Thoraco Lumber region: mechanical Principles, material, measurement/ casting, fabrication of all types of Orthoses Mechanism of action of lumber orthosis, Motion restriction, Unloading of spinal column, Side effect and other consideration, Outcome studies and effectiveness of lumber orthosis.
8	**Orthotic management of Scoliosis** : Anatomical consideration, Pathophysiology ,Biomechanical consideration involved in treatment, Terminology and Classification of scoliosis, Test and measures used in the clinical examination, Treatment consideration, Use of Radiograph in Diagnosis, digital measurement techniques, Surgical intervention for scoliosis, Nonsurgical intervention for scoliosis, Pre and Orthotic management. Kyphosis : Pathophysiology, Biomechanical consideration ,Treatment consideration, Orthotic management, Scheuermann's kyphosis , post traumatic kyphosis
9	**Orthotic management of Osteoporosis**-Pathophysiology, Biomechanical consideration, Clinical assessment and Orthotic management, Treatment consideration, Posture training support, Lumbosacral corset and dorso- lumbosacral corset, TLSO- sagittal plane control, TLSO- saggital and coronal plane control , Management of acute and chronic pain, Current issues and research
10	Spondylosis, Spondylolisthesis & ankylosing spondylitis: Clinical Symptoms, etiology , diagnostic interventions Pathophysiology, Biomechanical consideration, Treatment consideration, Orthotic interventions.
11	**Orthosis for spinal fracture and trauma**: Pathophysiology of fracture, Mechanism of injury, Classification of fracture, effects and complications of spinal fractures, Cervical spine fracture, Facet joint dislocation, Thoracic and thoraco-lumbar spine fracture, Lumber spine fracture, Compression fracture, Burst fracture, Seat belt fracture, Chance fracture, Hangman fracture, Odontoid fracture, Jefferson fracture, Current issues and research Post operative care, consideration for orthotic postoperative management, Orthotic intervention in spinal fracture.

12	Orthosis in spinal instability: Biomechanics, Pathophysiology in spinal instability, Role of Orthotist in treatment formulation. Types of spinal orthoses used in the treatment of spinal instability. Effects of body alignment, balance and compensation.
13	**Orthotic Assessment and Evaluation:** Training in systematic assessment and evaluation of individuals with spinal disorders, including patient history on pathological conditions, physical examination, gait analysis, and functional assessment. Emphasis in identifying impairments, functional limitations, and patient-specific goals
14	**Outcome Measurement and Follow-Up:** Strategies for evaluating the effectiveness of orthotic interventions and monitoring patient progress over time. Utilization of outcome measures, functional assessments, and patient-reported outcomes to assess treatment outcomes and adjust orthotic interventions as needed

Reference Text Books and Journals

S. NO	Author	Title with Edition	Publisher	Year/volume
1.	Norbert Boos	Spinal Disorders Fundamentals of Diagnosis and Treatment	Springer Berlin Heidelberg	2008
	Thomas N. Byrne, Stephen G. Waxman, Edward C. Benzel	Diseases of the Spine and Spinal Cord	Oxford University Press, USA	2000
3.	Jason C Eck, Christian P DiPaola	Essentials of Spinal Disorders	Jaypee Brothers Medical Publishers Pvt. Limited	2014
4.	KentonD.Leatherman Rober A. Dickson	The Management of Spinal deformities	Butter worthHeinemann Ltd. Linacre House, Jordon Hill,Oxford OX2 BDP	
5.	Seymour, Ron	Prosthetics & Orthotics LowerLimb& Spine		2002

TITLE- Clinical Prosthetic and Orthotic Practice in Surgical and Orthopedic Conditions
COURSECODE--- BPO305
TEACHINGHOURS - Theory (60)
CREDITS---02

Course Descriptions: This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on conditions related to surgery and orthopedics. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with individuals who require prosthetic or orthotic devices due to surgical or orthopedic conditions.

Learning Objectives and Outcomes:

- Clinical Competence: Develop the ability to clinically examine, diagnose, and recommend appropriate non-operative and operative management for a variety of orthopedic conditions.
- 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.
- Operative Proficiency: Attain proficiency in understanding the principles and indications for operative treatments, including surgical interventions for fractures, dislocations, and amputations.
- Complication Management: Demonstrate knowledge in preventing, identifying, and managing complications associated with fractures, dislocations, and surgical interventions.
- Rehabilitation Skills: Acquire skills in prosthetic and orthotic management, including the application of devices and techniques for rehabilitation in diverse orthopedic cases.
- Multidisciplinary Collaboration: Develop an understanding of the collaborative approach between orthopedics, physiotherapy and prosthetics/orthotics for comprehensive patient care.
- Device Application: Demonstrate the ability to select and apply appropriate orthopedic devices, considering individual patient needs and specific conditions.
- Clinical Decision-Making: Enhance clinical decision-making skills through the integration of theoretical knowledge with practical application in the management of orthopedic cases.
- Patient Education: Effectively communicate with patients regarding their conditions, treatment options, and the use of orthopedic devices, empowering them in their rehabilitation journey.

DETAILED CONTENTS

S.NO	TOPIC
1.	**General Orthopedics :-**Overview of Pelvic Traction Kit without weight, Cervical Traction Kit (Sitting), Cervical Traction Kit (Lying) Spread Traction Kit without weight bilateral,
	Skin Traction Kit, Thomas Ring, Clavicular Brace/Ring, Arms Pouch Sling, Arms Pouch Sling with Shoulder immobilizer, Elastic Ankle Binder, Elastic Tennis Elbow Strap, Elastic Wrist Brace, Bebathe Cuff (Different Designs). Ankle support, Diabetic Orthotic Walker,Plantar fasciitis Night Splint, Toronto Orthosis, Dail Lock KAFO, Swivel Walker, Knuckle bender splint, Parapodium, RGO/HGO. Supportive and corrective appliances in the rehabilitation of orthopedic cases. Adapted devices in the rehabilitation of orthopedic cases. Activities of daily living, testing and training in A.D.L
2	**Prosthetic management of Upper and Lower limb Amputations** - Outline pre-operative, operative and prosthetic management. **Lower limb Prosthetics Practice in Orthopedics:** Prosthesis for ray amputation, digit amputation, chopart amputation, Lisfranc amputation, Symes/Boyd amputation, Transtibial amputation, Knee Disarticulation, Transfemoral amputation, Hip disarticulation, Hemipelvictomy, Trans-lumbar amputation, bilateral transtibial amputation, bilateral transfemoral amputation, multiple amputations.
3	**Upper limb Prosthetics Practice in Orthopedics:** Prosthesis for finger, Thumb, Partial hand amputation, Wrist disarticulation, Trans-radial amputation, Elbow disarticulation, Pro sthesis for transhumeral amputation, Prosthesis for shoulder disarticulation, Forequarter amputation, Bilateral upper limb amputation, Prosthesis for multiple limb amputation
4	**Congenital Lower limb Prosthetics Practice in Orthopedics:** Different congenital lower limb anomalies/deficiencies including Transverse and longitudinal deficiencies: Prosthesis for PFFD/LDFP, Tibial/Fibular Hemi-melia, Prosthesis for multiple limb deficiencies, Prosthesis for various congenital upper limb deficiencies mainly including Transverse deficiencies
5.	**Congenital upper limb Prosthetics Practice in Orthopedics:** Different congenital upper limb anomalies/deficiencies including Transverse and longitudinal deficiencies: Prosthesis for transverse deficiencies at various level of upper limb which appear similar to amputations, Prosthesis for multiple transverse limb deficiencies,
6	**Orthotics in Fractures and Dislocations:** Outline the mechanism, clinical features, and principles of management and complications of spinal injuries. Recurrent Dislocations: Outline the mechanism, clinical features, principles of management and complications of recurrent dislocation of the shoulder and patella. Orthosis for malignant bone and joint tumors, Orthosis for Osteosarcomas, Osteomas, Osteoclastomas, Ewing‘s sarcoma, Multiple myeloma.
7	**Functional fracture Bracing-** Principles, indications, Contra indication Working principles. Orthosis for tibial fracture, Orthosis for femur fracture, Orthosis for patellar fracture, Orthosis for foot bone fracture, Orthosis for pelvis fracture, Orthosis for spine fracture, Orthosis for humerus fracture, Orthosis for radius fracture, Orthosis for Ulnar fracture
8	**Orthosis in Spine fracture**: - Principles and mechanism

9	**Prosthetics and Orthotics in Arthritis:** Outline of pathology: clinical features, mechanism of deformities, management and complications of: Rheumatoid arthritis. Osteoarthritis of major joints and spine, Ankylosing spondylitis. Neck & Back Pain, Painful Arc Syndrome, Tendinitis, Fascitis & Spasmodic Torticollis, (Outline the above including clinical features and management), P&O in Spinal and Other Deformities: Classify spinal deformities and outline the salient clinical features, management and complications of Scoliosis, Kyphosis and Lordosis, Cervical Rib, Common acquired deformities of foot, knee, hip, shoulder, elbow and wrist including hand, P&O In Poliomyelitis: Describe the pathology, microbiology, prevention, management and complications of polio. Outline the treatment of residual paralysis including use of orthosis, Principles of muscle transfers and corrective surgery
10	**Prosthetics and Orthotics in Congenital Deformities:** Outline the clinical features and management of Congenital Telepus Equino Varus (CTEV), Congenital Dislocation of the Hip, Flat foot, vertical talus, limb deficiency (radial club hand and femoral, tibial and fibula deficiencies) meningomyelocele, Arthrogryposis multiplex congenita and Osteogenesis imperfecta , P&O in Peripheral Nerve Injuries: Outline the clinical features and management, including reconstructive surgery of: a) Radial, median and ulnar nerve lesions. b) Sciatic and lateral popliteal lesions. c) Brachial Plexus injuries including Erbs, Klumpke‘s and crutch palsy, Claw Hand, Hand Injuries: Outline of clinical features, management and complications of: Skin and soft tissue injury, tendon injury, bone and joint injury.
11	**Prosthetics and Orthotics in Leprosy:** Outline of clinical features, management and complications of neuritis, muscle paralysis, tropic ulceration and hand & feet deformities. Brief review of the above conditions and various physiotherapeutic modalities, aim, means and techniques of physiotherapy should be taught in detail. Degenerative & Infective Conditions-Osteoarthritis of major joints, Spondylosis, Spondylolisthesis, PID, Periarthritis Shoulder, T.B. Spine, Bone & Major joints; Perthe‘s disease; Cumulative Trauma Disorder

Reference Text Book and Journals

Sl.No.	Author	Title	Publisher	Year/Vol.
1.	Terke, Samual L.	Orthopedics: principles and their application	Lippencott, New York	1984
2.	David A. Spiegel, Michelle Foltz, Richard A. Gosselin	Global Orthopedics Caring for Musculoskeletal Conditions and Injuries in Austere Settings	Springer Internation al Publishing	2019
3.	Joan E. Edelstein, Alex Moroz	Lower-limb Prosthetics and Orthotics Clinical Concepts	SLACK	2011
4.		Prosthetics and Orthotics	Prentice	2002
5.		Engineering and Desig	Hill	
6.	Mohit Bhandari	Evidence-Based Orthopedics	wiley	2021
7	ChinmayM. Gupte,Kapil ugand	ABC of Orthopaedics and Trauma	Wiley	2018
8	David Ip	Casebook of Orthopedic Rehabilitation Including Virtual Reality	Springer Berlin Heidelberg	2007
9	**WHO Package of Intervention for Rehabilitation: Musculoskeletal Conditions**			

TITLE- Clinical Prosthetic and Orthotic Practice in Neurological Conditions
COURSECODE--- BPO306
TEACHINGHOURS - Theory (60)
CREDITS---02

Course Description: This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on neurological conditions. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with individuals who have neurological disorders requiring prosthetic or orthotic devices.

Learning Objectives and Outcomes:

- Clinical Competence: Demonstrate clinical competence in addressing the needs of individuals with neurological conditions, showcasing the ability to apply theoretical knowledge to practical rehabilitation scenarios.
- 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.
- Effective Assessment: Exhibit proficiency in conducting comprehensive assessments of neurosurgical injuries, enabling accurate diagnosis and formulation of appropriate rehabilitation plans.
- Customized Rehabilitation Plans: Develop the expertise to create customized rehabilitation plans, integrating supportive and corrective appliances that cater to the specific requirements of individuals with neurological challenges.
- Enhanced ADL Functionality: Achieve the outcome of improved Activities of Daily Living functionality for patients by providing targeted training and adaptive devices.
- Neurosurgical Collaboration: Foster collaboration with neurosurgeons by effectively contributing to the pre and postoperative management of patients undergoing neurosurgical procedures, emphasizing prosthetic and orthotic interventions.
- Patient-Centered Care: Emphasize patient-centered care by considering the unique needs and preferences of individuals with neurological conditions, ensuring a holistic approach to their rehabilitation.
- Continuous Improvement: Cultivate a commitment to continuous improvement by staying abreast of

advancements in prosthetic and orthotic practices related to neurological conditions, contributing to ongoing professional development.

DETAILED CONTENTS

S.NO	TOPIC
1.	Introduction: Overview of common neurological conditions that may necessitate prosthetic or orthotic interventions. • Hemiplegia • Cerebral palsy • Tetraplegic Syndrome • Multiple Sclerosis • Tabes Dorsalis • Transverse Myelitis • Polio Myelitis • Parkinson's Disease • Motor Neuron Disease • Poly Neuritis Ataxia • Extra Pyramidal Lesion, Cervical & Lumbar Spondylosis and Disc Prolapse , Intracranial Tumors, Acute infections of CNS – Encephalitis, Meningitis and Poliomyelitis, G.B.Syndrome and Myasthenia Gravis
2	Neuroanatomy and Pathophysiology: Neuroanatomy relevant to prosthetic and orthotic interventions. Pathophysiology of neurological conditions affecting the musculoskeletal system.
3	Peripheral Neuropathy • Peripheral Nerve Injuries • Sciatica • Brachial Neuritis and Neuralgia • Facial Palsy and Bell's Palsy • Syringomyelia • Monoplegia
4	Myopathy and Muscular Dystrophy • Sub-acute Combined Degeneration of Spinal Cord • General and Physiotherapeutic management of Psychiatric Patients Neuro-Surgery • Pre and Post-operative P&O management of Neuro- Surgical conditions and complications • Peripheral Nerve Injuries • Pre and Post-operative physiotherapeutic management of Nerve Repair I Grafting. • Head Injury, Laminectomy, Surgery following Brain Tumor and Craniotomy etc.
5.	Prosthetic Intervention- custom-designed prosthesis and use of specialized components to optimize function and comfort for individuals with limb loss due to neurological conditions or associated complications such as vascular disease or trauma
6.	Orthotic Intervention: custom-designed Orthosis for individuals with neurological conditions such as Ankle-Foot Orthoses (AFOs), knee-ankle-foot orthoses (KAFOs), hand splints, and dynamic orthoses for upper limb
7	Role of Prosthetics &Orthotics in Neurosurgery : Mechanism of injury, Primary & secondary complications, Assessment Supportive and corrective appliances with respect to rehabilitation. Adapted Devices with respect to rehabilitation. Activities of daily living and training in A.D.L
8.	Gait Training and Rehabilitation: Use of assistive devices such as walkers, canes, or crutches, as well as specialized orthotic interventions to optimize gait mechanics and minimize gait deviations. Common Gait deviations in Transtibial and Transfemoral Prosthesis and its outcome measurments
9.	Functional Mobility Assessment: Use of various tools for functional mobility assessments to evaluate the impact of prosthetic and orthotic interventions on the individual's ability to perform activities of daily living and participate in functional tasks. This may include assessing mobility, transfers, stair negotiation, and other functional activities to measure progress and adjust treatment plans as needed.
10.	**Orthosis in Cerebral Palsy**: Various Orthosis in spastic Hemiplegia, Diplegia and Quadriplegia for upper and lower limb conditions, Orthosis for Spinal condition in Spastic postural abnormalities, Orthosis for Crouch, Vaulting, Circumduction, Scissoring type of gait, Various orthosis for hypotonic conditions
11	Orthotics in Neurological condition: Orthosis for Peripheral Nerve Injuries, Orthosis for Radial, median and ulnar nerve lesions, Orthosis for Sciatic and lateral popliteal lesions. , Orthosis for Brachial Plexus injuries including Erbs, Klumpke‘s and crutch palsy, Claw Hand, Orthosis for meningomyelocele, Orthosis for Poliomyelitis, Orthosis for Hansen disease, Orthosis for Carpal Tunnel Syndrome, Orthosis for cubital tunnel syndrome, Orthosis for PID, Orthosis for neuritis, muscle paralysis, Orthosis for tropic ulceration. Orthosis for TBI, Orthosis for Parkinson‘s

	disease, Orthosis in stroke, Orthosis in Amyotrophic Lateral sclerosis, Orthosis in Down's syndrome and Autism, Orthosis in Bell's Palsy, Orthosis in Brown Sequard Syndrome, Orthosis in Charkot Marie Tooth Disease, Orthosis in Cerebral Atrophy, Orthosis in Crushing syndrome, Orthosis in Klippel feil Syndrome
12	**Orthotics in Spinal Cord Injuries**: Clinical assessment and Orthotic management in various level of spinal cord injury, Impact of orthotic management in SCI patient, Type of orthotic device used in SCI patient, Current issue and researches. Current issues and research
13	**Orthotics in Post Stroke**: Clinical assessment and Orthotic management in post Stroke management, Impact of orthotic management in hemiplegia patient, Type of orthosis used in post stroke hemiplegic patient, Current issues and research.

Reference Text Book and Journals

SL No	Author	Title with Edition	Publisher	Year/V olume
1	Meeko Mitsuko K. Oishi, Ian M. Mitchell, H. F. Machiel Van der Loos	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Springer Science & Business Media,	2010
2	P. John Clarkson, P. Langdon, P. Robinson	Designing Accessible Technology	Springer Science & Business Media,	2006
3	Stasolla, Fabrizio	Assistive Technologies for Assessment and Recovery of Neurological Impairments	IGI Global	2021
4	Marcia J. Scherer	Assistive Technologies and Other Supports for People With Brain Impairment	Springer Publishing Company	2012
5	D. Jude Hemanth	Handbook of Decision Support Systems for Neurological Disorders	Academic Press	2021
6	Ladan Najafi, Donna Cowan	Handbook of Electronic Assistive Technology	Academic Press	2018
7	Brian O'Neill, Alex Gillespie	Assistive Technology for Cognition: A handbook for clinicians and developers	Psychology Press	2014
8	Meeko Mitsuko K. Oishi, Ian M. Mitchell, H. F. Machiel Van der Loos	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Springer Science & Business Media	2024
9	Hariton Costin, Björn Schuller, Adina Magda Florea	Recent Advances in Intelligent Assistive Technologies: Paradigms and Applications	Springer Nature	2019
10	J. Hughes	Powered Lower Limb Orthotics in Paraplegia		

11	Suzanne Robitalle	The Illustrative Guide to Ass Technology and Devices	Demos Medical Publishing	2009
12	**WHO Package of Intervention for Rehabilitation: Neurological Conditions**			2024
13				

PRACTICALS (3rd Year)

TITLE ----- Clinical Orthotics Practice in Spinal pathologies and Disorder
COURSE CODE--- BPO 351
TEACHING HOURS- 240
CREDITS --- 08

Course Description: This course is designed for prosthetic and orthotic students, with specialized knowledge and skills related to the management of spinal pathologies and disorders. Participants will explore the application of orthotic interventions in the context of spinal conditions, with a focus on assessment, design, and rehabilitation strategies.

Learning Objectives:

- Understand Spinal Pathologies.
- 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.
- Impact of spinal conditions on mobility, function, and quality of life
- Enhance clinical reasoning and decision-making abilities in orthotic management through case-based learning and clinical simulations.
- Analyze the biomechanics of the spine and its role in various spinal pathologies.
- Relate biomechanical principles to the design and function of prosthetic and orthotic devices for spinal support.
- Evaluate materials and design considerations for spinal orthoses
- Apply appropriate clinical assessment techniques for individuals with spinal disorders.
- Foster effective communication and collaboration within interdisciplinary healthcare teams to optimize patient outcomes.
- Develop treatment plans that incorporate prosthetic and orthotic interventions for spinal conditions.
- Modify orthotic interventions to meet the developmental and age-specific needs of patients.
- Adhere to legal standards and responsibilities when providing prosthetic and orthotic services for spinal conditions.
- Engage in networking and collaboration with professionals in the spinal rehabilitation community.
- Promote evidence-based practice through critical appraisal of current literature and research in the

field of clinical orthotics.

S.NO	TOPIC
1.	Assessment, Prescription, design, fitment and delivery of spinal orthosis for different spinal deformity ..
2	Assessment, design, fitment, and delivery of spinal orthosis for different spinal arthritis condition
3	Assessment, design, fitment and delivery of spinal orthosis for different Inflammato spinal condition
4	Assessment, design, fitment and delivery of spinal orthosis for different degenerative spine condition.
5	Assessment, design, fitment and delivery of spinal orthosis for different spinal fracture condition
6	Assessment, design, fitment and delivery of spinal orthosis for different spinal pain condition

TITLE- Clinical Prosthetic and Orthotic Practice in Surgical and Orthopedics Conditions - Practical
COURSE CODE--- BPO352
TEACHING HOURS:240
CREDITS---08

Couse Description: This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on conditions related to surgery and orthopedics. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with individuals who require prosthetic or orthotic devices due to surgical or orthopedic conditions.

Learning Objectives and Outcomes:

- Clinical Competence: Develop the ability to clinically examine, diagnose, and recommend appropriate non-operative and operative management for a variety of orthopedic conditions.
- 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.
- Operative Proficiency: Attain proficiency in understanding the principles and indications for operative treatments, including surgical interventions for fractures, dislocations, and amputations.
- Complication Management: Demonstrate knowledge in preventing, identifying, and managing complications associated with fractures, dislocations, and surgical interventions.
- Rehabilitation Skills: Acquire skills in prosthetic and orthotic management, including the application of devices and techniques for rehabilitation in diverse orthopedic cases.
- Multidisciplinary Collaboration: Develop an understanding of the collaborative approach between orthopedics, physiotherapy and prosthetics/orthotics for comprehensive patient care.
- Device Application: Demonstrate the ability to select and apply appropriate orthopedic devices, considering individual patient needs and specific conditions.
- Clinical Decision-Making: Enhance clinical decision-making skills through the integration of theoretical knowledge with practical application in the management of orthopedic cases.
- Patient Education: Effectively communicate with patients regarding their conditions, treatment options, and the use of orthopedic devices, empowering them in their rehabilitation journey.

DETAILED CONTENTS

S.NO	TOPIC
1.	All types of prostheses, orthoses and assistive devices used in Surgical and Orthopedics Conditions.

Reference Text Books and Journals

Sl.No.	Author	Title	Publisher	Year/Vol.
1.	Terke, Samual L	Orthopedics: principles and their application	Lippencott, New Yo	
2.	David A. Spiege Michelle Foltz, Richard A. Gosselin	Global Orthopedics Caring for Musculoskeletal Conditions and Injuries in Austere Settings	Springer Internatior Publishing	2019
3.	Joan E. Edelstein Moroz	Lower-limb Prosthetics and Orthotic Clinical Concepts	SLACK	2011
4.	Donald G. Shurr W. Michael, Tho Michael Cook	Prosthetics and Orthotics	Prentice Hall	2002
5.	Myer Kutz	Standard Handbook of Biomedical Engineering and Desig	McGraw- Hill	2003
6.	Mohit Bhandari	Evidence-Based Orthopedics	wiley	2021
7.	Chinmay M. Gu Kapil Sugand	ABC of Orthopaedics and Trauma	Wiley	2018
8.	David Ip	Casebook of Orthopedic Rehabilitat Including Virtual Reality	Springer Berlin Heidelberg	2007

TITLE- Clinical Prosthetic and Orthotic Practice in Neurological Conditions- Practical
COURSE CODE--- BPO 353
TEACHING HOURS: 240
CREDITS---08

Course Description: This course is designed to provide students with the knowledge and skills necessary for clinical practice in the field of prosthetics and orthotics, with a specific emphasis on neurological conditions. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with individuals who have neurological disorders requiring prosthetic or orthotic devices.

Learning Objectives and Outcomes:

- Clinical Competence: Demonstrate clinical competence in addressing the needs of individuals with neurological conditions, showcasing the ability to apply theoretical knowledge to practical rehabilitation scenarios.
- Effective Assessment: Exhibit proficiency in conducting comprehensive assessments of neurosurgical injuries, enabling accurate diagnosis and formulation of appropriate rehabilitation plans.
- Customized Rehabilitation Plans: Develop the expertise to create customized rehabilitation plans, integrating supportive and corrective appliances that cater to the specific requirements of individuals with neurological challenges.
- Enhanced ADL Functionality: Achieve the outcome of improved Activities of Daily Living functionality for patients by providing targeted training and adaptive devices.
- Neurosurgical Collaboration: Foster collaboration with neurosurgeons by effectively contributing to the pre and postoperative management of patients undergoing neurosurgical procedures, emphasizing prosthetic and orthotic interventions.
- Patient-Centered Care: Emphasize patient-centered care by considering the unique needs and preferences of individuals with neurological conditions, ensuring a holistic approach to their rehabilitation.
- Continuous Improvement: Cultivate a commitment to continuous improvement by staying abreast of advancements in prosthetic and orthotic practices related to neurological conditions, contributing to ongoing professional development.

DETAILED CONTENTS

S.NO	TOPIC
1.	All types of Prostheses, orthoses and assistive devices used in **Neurological Conditio**

Reference Text Books and Journals

s. no.	Author	Title with Edition	Publisher	Year/ Volume
1	Meeko Mitsuko K. Oishi, Ian M. Mitchell, H. F. Machiel Van der Loos	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Springer Science & Business Media,	2010
2	P. John Clarkson, P. Langdon, P. Robinson	Designing Accessible Technology	Springer Science& Business Media	2006
3	Stasolla, Fabrizio	Assistive Technologies for Assessment and Recovery of Neurological Impairments	IGI Global	2021
4	Marcia J. Scherer	Assistive Technologies and Other Supports for People With Brain Impairment	Springer Publishing Company	2012
5	D. Jude Hemanth	Handbook of Decision Support Systems for Neurological Disorders	Academic Press	2021
6	Ladan Najafi, Donna Cowan	Handbook of Electronic Assistive Technology	Academic Press	2018
7	Brian O'Neill, Alex Gillespie	Assistive Technology for Cognition: A handbook for clinicians and developers	Psychology Press	2014
8	Mitsuko K. Oishi, Ian M. Mitchell, H. F. Machiel Van der Loos	Design and Use of Assistive Technology: Social, Technical, Ethical, and Economic Challenges	Springer Science & Business Media	2021
9	Hariton Costin, Björn Schuller, Adina Magda Florea	Recent Advances in Intelligent Assistive Technologies: Paradigms and Applications	Springer Nature	2019
10	R A Cooper	Wheel chair selection & configuration	Demos Medical Publishing	1998
11	J. Hughes	Powered Lower Limb Orthotics in Paraplegia		2021
12	Suzanne Robitalle	The Illustrative Guide to Assistive Technology and Devices	Demos Medical Publishing	2009

TITLE- CLINICAL BIOMECHANICS, GAIT & POSTURE ANALYSIS- PRACTICAL
COURSE CODE--- BPO354
TEACHING HOURS---60
CREDITS --- 02

COURSE DESCRIPTION: This course provides an in-depth exploration of clinical biomechanics, gait analysis, and posture analysis. Students will gain comprehensive knowledge of practical applications of these areas within clinical practice. Through a combination of lectures, laboratory sessions, case studies, and practical exercises, students will develop the skills necessary to assess, analyze, and interpret biomechanical factors influencing human movement and posture.

Learning Objectives:

- Understand the fundamental principles of biomechanics and their relevance to clinical practice.
- Analyze normal and abnormal gait patterns, identifying biomechanical factors contributing to gait deviations.
- Evaluate static and dynamic posture, recognizing postural deviations and their implications for musculoskeletal health.
- Utilize various assessment techniques and tools for gait and posture analysis in clinical settings.
- Interpret biomechanical data to formulate appropriate treatment plans and interventions.
- Apply ethical considerations and best practices when conducting biomechanical assessments.

DETAILED CONTENTS

S.NO	TOPIC
1.	Gait Analysis of Transtibial Amputee
2	Gait Analysis of Transfemoral Amputee
3	Posture Assessment Methods
4	Analysis of Common Postural Deviations
5	Case Studies: Analysis of real-world cases to apply theoretical knowledge
6	Group Discussions: Collaboration and problem-solving exercises.
7	Gait analysis of individual using orthosis

FOURTH YEAR

TITLE-----CLINICAL PROSTHETICS AND ORTHOTICS PRACTICE IN PAEDIATERIC
COURSE CODE---BPO- 401
TEACHING HOURS: THEORY-60, PRACTICAL-210
CREDITS--- 2 +7 = 9

Course Description: This course is designed to provide students with the knowledge and skills required for clinical practice in the field of prosthetics and orthotics specially tailored for pediatric patients. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with children who require orthotic or prosthetic devices.

Learning objectives and *Outcomes:*

- Comprehensive Understanding:
  - Students will acquire a comprehensive understanding of orthotic and prosthetic management tailored to pediatric and geriatric populations.
- Diagnostic Proficiency:
  - Students will develop diagnostic proficiency in assessing a range of musculoskeletal and neurological conditions relevant to orthotic and prosthetic interventions.
- Prescription Competence:
  - Students will demonstrate competence in prescribing orthotic and prosthetic devices based on thorough assessments and diagnostic criteria.
- Pediatric Specialization:
  - Students will be specialized in pediatric orthotic and prosthetic care, including assessment, evaluation, and management strategies.
- Wound Care Proficiency:
  - Students will acquire proficiency in wound care techniques, particularly in the context of diabetes and pediatric foot care.

- Preventive Strategies:
  - Graduates will develop preventive strategies for sports-related foot injuries for pediatric patients.
- Interdisciplinary Collaboration:
  - Students will understand the importance of interdisciplinary collaboration in providing holistic care to pediatric populations.
- Research and Innovation:
  - Students will be encouraged to engage in research activities, promoting innovation in orthotic and prosthetic care for pediatric patients.

DETAILED CONTENTS

S.NO	TOPIC
1.	Introduction to pediatric Prosthetics and Orthotics: Overview of the unique considerations and challenges in providing orthotic and prosthetic care to pediatric patients. Developmental stages and growth patterns in children.
2	Assessment and Evaluation in Pediatric Practice: Methods for assessing the orthotic and prosthetic needs of pediatric patients.
3	Orthotic Management in Pediatrics. Growth and development- Maternal and neonatal fracture contributing to high-risk baby, CP, Myopathy, Spina bifida, Still‘s disease, Acute CNS infection, Lung infection, CTEV, CDH, Leg calf perthes disease, Erb‘s palsy and arthrogryposis multiplex congenital Podiatric, Assessment, Evaluation, diagnostic tools, prescription criteria
4	Pediatric Prosthetics: Overview of various prosthetic devices designed for children, specially extension prosthesis; Customization, fitting, alignment functional training for pediatric prosthetic users.
5	Ethical Considerations in Pediatric Care: Ethical principles in pediatric orthotics and prosthetics practice.
6	Cultural Competence and Family Centered Care: considerations in orthotic and prosthetic care
7	Emerging Technologies and Innovations: Introduction to cutting-edge technologies in pediatric prosthetics and orthotics.

Reference Text Book and Journals

1	Michael A. Alexander, De Mstthews	Pediatric Rehabilitation Principles and Practices	demosme dical	5th ed.
2	Hsu, John D.	AAOS atlas of Orthosis and assistive d	Mosby publications/	5th ed.
3	Michelle M. Lusardi PhD Caroline C. Nielsen PhD	Orthotics and Prosthetics in Rehabilitation		3rd ed.
4	Kevin P. Murphy,Mary A. McMahon, Amy J. Houtrom	Pediatric Rehabilitation Principles and Practices		6th ed.
5	Albert M. Cook,Jaan Miller Polgar,Pedro Encarnacao	Assistive Technology Principles and Practice		5th ed.
6.	R Chinnathurai	Short Testbook of Prosthetics & Orthotics		1st ed.
7.	Douglas Murphy	Fundamentals of Amputation Care And Prosthetics		1st ed.

TITLE- Clinical Prosthetics and Orthotics Practice in Podiatric, Sports and Diabetic Conditions
COURSE CODE--- BPO 402
TEACHING HOURS- Theory-60 Practical-240
CREDITS --- 02 (Theory-02)

Course description: The student will have experience in the clinical environment to deliver

prosthetic and orthotic services in the context of podiatric, sports, and diabetic conditions to the patients by the application of biomechanical principles and technology to improve mobility, function, and quality of life for patients.

The student will develop the skills in :

- Effective Communication
- Assessment and prescription.
- Clinical provisions of prosthesis & orthoses;
- Designing of appropriate prostheses and orthoses for given condition
- Interpersonal relationships amongst the health care professionals
- Organisation and management;
- Clinical research.
- Contributing too and learning from the clinic team.
- Analytical and problem-solving skills through case studies and practical exercises

S.NO	TOPIC
1.	Podiatric , Assessment , Evaluation, diagnostic tools, prescription criteria , Neuropathic foot, Diabetes Foot Care Management ,Wound Care Management, Podiatric Foot Care Management, Sports Foot Injuries Care And Prevention, POP cast management & advanced management. Comprehensive review of common podiatric conditions affecting the foot and ankle, including plantar fasciitis, hallux valgus, Achilles tendonitis, and flat feet. Exploration of foot biomechanics, gait analysis, and the relationship between foot structure and function. Comprehensive management of limb loss cases, focusing on prosthetic compatibility with residual limbs and minimizing secondary complications. Orthotic Assessment and Prescription: Training in assessment and evaluation of individuals with podiateric conditions. Discussion of orthotic options, including custom foot orthoses, ankle-foot orthoses (AFOs), and footwear modifications. Consideration of patient-specific factors, functional goals, and biomechanical principles in orthotic prescription. Wound Care and Offloading Techniques: Strategies for wound assessment, debridement, and management in individuals with diabetic foot ulcers or other foot-related wounds. Training in offloading techniques using orthotic devices, total contact casts, and other modalities to reduce pressure and promote wound healing. Prosthetic Intervention for Foot Amputations: Introduction to prosthetic options for individuals with partial or complete foot amputations, including transtibial and transfemoral prostheses, foot prostheses, and prosthetic socks. Discussion of prosthetic socket design, alignment principles, and gait training techniques for prosthetic users. Blade Foot and Sports foot prosthesis

2	Diabetes and its complications - An overview- the pharmacotherapy of diabetes incorporating the latest guidelines, and discusses the pathophysiology of diabetic vascular complications
3	Diabetic peripheral neuropathy-– its burden and classification, the risk factors for peripheral neuropathy, the clinical presentation and evaluation of peripheral neuropathy in diabetes through demonstrative videos, and explains the prevention and management of diabetic neuropathy
4	Peripheral arterial disease- This Unit includes peripheral arterial disease (PAD), the classification and staging of PAD, the various risk factors for PAD, the clinical features and diagnostic testing of PAD through a demonstrative video, and discusses the different modalities of managing PAD
5	Orthotic Assessment and Prescription: assessment and evaluation of individuals with diabetic foot conditions. Discussion of orthotic options, including custom foot orthoses, ankle-foot orthoses (AFOs), and footwear modifications. Consideration of patient-specific factors, functional goals, and biomechanical principles in orthotic prescription.
6	Examination of sports-related foot and ankle injuries, such as ankle sprains, stress fractures, and Achilles tendon injuries. Discussion of injury prevention strategies, rehabilitation protocols, and the role of orthotic interventions in supporting athletic performance and injury recovery. Prosthetics and Orthotics Integration in Sports Medicine: Application of prosthetic and orthotic devices in sports injury prevention, Rehabilitation strategies using prosthetics and orthotics for athletes, Adaptive Prostheses for Sports and Recreation, Orthoses for Sports and Recreation, Psychological Determinants, Technical Aids and Prostheses, Sport-Specific management orthosis

Reference Text Books and Journals

S.No.	Author	Title	Publisher	Year/Vol.
1	AK Agarwal	Essential of Prosthetics & Orthotics (Wit MCQs & disability Assessment and guid	Jaypee	1st ed.
2	Hsu, John D.	AAOS atlas of Orthosis and assistive dev	Mosby publications	5th ed.
3	Michelle M. Lusardi PhD And Caroline C. Nielsen	Orthotics and Prosthetics in Rehabilitatio		3rd ed.
4	Kevin K. Chui ,Milagros Jorge,Sheug – Che Yun,M	Orthotics and Prosthetics in Rehabilitatio		4th ed.
5.	Dr. Ankur Jain,Dr. Ankit Mohan	Text Book of Prosthetic Rehabilitation In Paediatrics Dentistry(A Complete Guide Prosthesis)		
6.	Clifford P. Shearman	Management of Diabetic Foot Complicat	Springer London	4 February 2015
7.	Adam Bohr, Kaveh Memarzadeh	Artificial Intelligence in Healthcare	Elsevier Science	21 June 2020
8.	James Chambers	Physical Disability and Rehabilitation Sourcebook, 1st Ed.	Infobase Publishing	2019
9.	Adam Bohr, Kaveh Memarzadeh	Physical Disability and Rehabilitation Sourcebook, 1st Ed.	Elsevier Science	2020
10.	David X. Cifu, Henry L.	Braddom‘s Rehabilitation Care: A Clinic Handbook E-Book	Elsevier Health Sciences	2017

Journals

- Journal of Prosthetics and Orthotics, ISSN: 1040-8800
- Prosthetics and Orthotics International, ISSN: 0309-3646
- National Institute of Health
- Standard for Prosthetic & Orthotics
- Journals of Rehabilitation R & D, ISSN O742-3241
- International Journal of Rehabilitation Research, ISSN: 0342-5282
- The Rehabilitation Journal , ISSN: 2521-344x
- JHO: Journal of Prosthetics & Orthotics , ISSN: 1040-8800
- Canadian Prosthetics & Orthotics Journal, ISSN: 2561-987X Journal of the American Orthotic and Prosthetic Association

TITLE----- Digital Technology in Prosthetics and Orthotics
COURSE CODE--- BPO 403
TEACHING HOURS- Theory-60, Practical-210
CREDITS --- 02 (Theory-02)

Course Description: This course explores the integration of digital technology into the field of prosthetics and orthotics. Students will examine the latest advancements in digital tools, techniques, and devices that enhance the design, fabrication, and fitting methodologies of prosthetic and orthotic devices. The course will cover a range of topics from digital scanning and modeling to the use of robotics and smart materials, providing a comprehensive understanding of the impact of technology on modern prosthetic and orthotic practices.

Learning Objectives:

- Explain the historical context and evolution of digital technology in the field of prosthetics and orthotics.
- Demonstrate proficiency in using 3D scanning and imaging technologies for capturing accurate anatomical data.
- Create, modify, and optimize digital models for customized prosthetic and orthotic devices
- Interpret and troubleshoot digital scans to ensure quality data acquisition
- Select appropriate materials and optimize designs for digital fabrication processes.
- Use VR and AR tools for design visualization and patient interaction in prosthetics and orthotics
- Analyze digital data to inform personalized device customization.
- Apply HMI principles for user-friendly device control
- Design prosthetic and orthotic interfaces that optimize user experience.

DETAILED CONTENTS

S.NO	TOPIC
1.	**Introduction to computers and Components of computers**: Physical Composition, Central Processing Unit, Main Memory, Input and Output units and all kinds of common types of computer peripherals. Hardware: Various Configurations, Specification of peripherals and computer System. Various types of storage facilities and its advantages and disadvantages. 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. Software: The current operating software‘s, Word Processor, spreadsheet, data baseand presentation software, e.g. Windows XP or Windows 10 or 11

2.	**Introduction to Conceptual Design and CAD**: Points, line and simple objects, Orthographic and isometric projection, Dimension on technical drawing, methods of dimension and tolerance. Introduction to Design Theories, develop a concept, implement a concept, creative methods for design, Introduction to CAD, CAD input devices, CAD output devices, CAD Software, Display Visualization Aids, and Requirements of Geometric Modelling, Transformations of Geometry, Developing algorithms/computer codes for transformations. Computer Graphics: Introduction to graphics software and packages, Function of graphic package in design and digital communication.
3.	**Introduction to Auto CAD & Fusion 360** updated version, Pro-E, CATIA and SOLID WORKS, Sketcher and other solid modeling packages: Finite element Method, Finite element analysis of solid object, Prosthetic and Orthotic Components.
4	**Introduction to Assembly Modeling & Approaches** – Top down and Bottom up approach, Applying Standard Mates- Coincident, Parallel, Perpendicular, Tangent, Concentric, Lock, Distance, Angle. Applying Advanced Mates – Symmetric, Width, Path Mate, Linear/Linear Coupler, and Limit Mate. Applying Mechanical Mates – Cam, Hinge, Gear, Rack Pinion, Screw, and Universal Joint. Manipulating Components - Replacing Components, Rotating Components, Move Components, Collision Detection, Physical Dynamics, Dynamic Clearance, Detecting Interference Creating Pattern - Assembly Pattern, Mirror, Creating Explode Views
5	**Industry 4**.0: Industry 4.0 environment, The role of Big data and IoT, Introduction to cyber-Physical system.
6	**3D Image Formats**: IGES format, OBJ, STP, STL Format, STL File Problems, STL File Manipulation and Repair Algorithms
7	**Digital Design of Customized Devices: Introduction** to 3D scanning, components of a 3D s scanning mechanisms, parameters of choosing a suitable 3D scanner, Categories & Types of sca Cleaning/ post processing of scanned data, file formats, comparison of conventional cast rectif and 3D post processing. Post processing software used in P&O industry. Advantages and disadva of 3d scanning. Introduction to 3D modeling &types. Basics of hardware and software requireme 3D modelling, Organic Modelling Software like Mesh mixer, free foam etc., tools used modelling software, comparison of tools used in conventional modification and 3D modelling, I of 3D modelling, different file formats and converting to desired extensions. Use of AI modelling software in P&O industry. Concept of Central Fabrication Unit.
8	**Computer Aided Manufacturing (CAM)** Introduction to 3d Printing, CNC Machines, Serial and parallel robots, Types of 3D Printer based on Printing Technology – Fused Deposition modelling, Stereo lithography, Selective laser Sintering, Polyjet , Multijet fusion. Slicing & printing process, Post processing of printed Job, uses of 3D Printers in P&O industry, Comparison between Manual fabrication , Subtractive manufacturing & Addictive Manufacturing in P&O industry
9	**Types of AM and it use in Prosthetics & Orthotics**: Classification of AM, Material used in AM, It sis application in P&O device fabrication. SLP, FFF, DLP and others
10	**Types of SM and it use in Prosthetics & Orthotics**: 7 axis carving robots, 4 and 5 axis routers, Subtractive manufacturing workflow.

Reference Books and Journals

Sl. No.	Author	Title	Publisher	Year/Vol.
	John Bacus	Digital Sketching Computer Conceptual Design	Wiley	2020
	Zhuming Bi, Xiaoqin Wang	Computer Aided Design an Manufacturing	Wiley	2020
	Dr. Sushil Kumar Choudha R. S Jadoun	Computer Integrated Manufacturing & Computer Manufacturing	Walnut Publication	2021
	Mike Lynch	Fundamentals of CNC An Extended Introduction to C Machining and Turning Cer Usage	CreateSpace Independer Publishing Platform	2013
	Ian Gibson, David Rosen, I Stucker, Mahyar Khorasani	Additive Manufacturing Technologies	Springer International Publishing	2020
	Jiri Marek, Ľubomír Šooš	Machine Tools Design, Res Application	IntechOpen	2020
	Mokhtar Arazpour	Prosthetics and Orthotics	IntechOpen	2021

Journals:
Journal of Prosthetics Orthotics and Science Technology
Journal of Prosthetics and Orthotics International
Journal of NeuroEngineering and Rehabilitation

TITLE----- Employability and Soft skill
COURSE CODE--- BPO 405
TEACHING HOURS- Theory (60)
CREDITS --- 02

Course Description: This course is designed to enhance students' employability by focusing on the development of essential soft skills. In today's competitive job market, possessing technical expertise alone is not enough. Employers increasingly seek candidates with strong soft skills, such as communication, teamwork, problem-solving, and adaptability. This course aims to equip students with the skills and knowledge necessary to thrive in diverse professional environments.

Overall objectives:

- To demonstrate competency in planning and implementing skill training for the disabled people and finding placements in the community.
- To demonstrate the ability to plan skill training activity, organize successful and gainful employment for the disabled people.
- To demonstrate the ability to conduct vocational assessment, identify and find suitable jobs and train the disabled accordingly.
- To know about various employment prospects and it could be of any type such as self- employment, small group employment, small scale business, large scale business, placement in private sectors and public sectors.

Detailed Content

S.NO	TOPIC
1	Key issues and principals involved in developing successful and gainful Employment - Implement pre vocational skills in different domains such as hygiene, money concept, social relationships, prehensile coordination, and time management by using pre vocational curriculum such as TALC (Training adolescence to live in the community) and other similar PVS/ability training curricula with adaptation to the individual needs and socio-cultural and economic conditions, Community mapping for employment resources from family trades, local trades and marketing opportunities, Identify trades in which the person can be gainfully employed , Vocational assessments and programming, Tapping community resources for employment
2	Planning and training of persons with disability - Planning and management of SHGs of adults with disabilities , Train youth with disabilities in planning and management micro- credit activities , Plan vocational training in the chosen trades by using neighborhood resources, Placements, marketing linkages, bank loans to start self and group employments to set-up micro credit groups of persons with disabilities, and or to include persons with disabilities in the existing self-help micro credit groups, Understand key principles involved in developing an IRP (Individual rehabilitation plans) and the implementation of IRPs with necessary documentation

3	Different ministries/Departments and other service providers - National Trust , Ministry of Labour and VRC‘s, Ministry of Social Justice and Empowerment – NI‘s , Ministry of Health & family welfare, Ministry of Rural development/MHRD , NGO‘s/DPO‘s /Parent organizations
4	Employment market, types of employment and Avenues - Labour and employment – definition, under employment, over employment and unemployment , Employment – Sectorial categorization–primary, secondary, tertiary , Types of employment – open, supported, self, sheltered and group , Apprenticeship ACT /on the job training/EPF contributions , Entrepreneurship / NHFDC schemes

Reference Textbooks and Journals

Sl. No.	Author	Title	Publisher	Year/Vol.
1	Bhuban Chandra Mahapatra	Training For Sustainable Development	Sarup & Sons	2005
2	Robert Heron	Job and Work Analysis Guidelines on Identifying Jo Persons with Disabilities	International Labo office	2005
3	Robert Heron, Barbara M	Assisting Disabled Persons Finding Employment A Practical Guide	International Labo Office	2003
4	International Labour International Labour Of Committee of Experts o Application of Conventi and Recommendations	Vocational Rehabilitation a Employment of Disabled P	International Labo Office	1998
5	International Labour Of	Achieving Equal Employm Opportunities for People wi Disabilities Through Legisl Guidelines	International Labo Office	2004
6	Will Tyson	Teaching and Learning Employability Skills in Car Technical Education Industry, Educator, and Stu Perspectives	Springer Internatio Publishing	2020

TITLE----- Management & Administration
COURSE CODE--- BPO 405
TEACHING HOURS- Theory-(60)
CREDITS --- 02

Course description:

The course is designed to provide students with a comprehensive understanding of the principles, theories, and practices of effective management in contemporary organizations.
This course explores the roles and responsibilities of Prosthetics and Orthotics professionals in planning, organizing, leading, and controlling various functions within an organization like store, Human resource, Finance and safety etc.

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.
- Develop a critical understanding of key management concepts and theories.
- Enhance analytical and problem-solving skills through case studies and practical exercises.
- 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.
- Foster a strategic mindset for planning, implementing, and evaluating organizational initiatives.
- 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 with inter personal relationship.
- Apply management principles to real-world scenarios and organizational challenges.

S.NO	TOPIC
1.	**Introduction** Introduction to management and organization, administration, principles of management. Functions of management – planning, organizing, directing, controlling, Human Resource Management, Innovation and Entrepreneurship, Leadership, Motivation & strategic planning.

2	**Entrepreneurship & Marketing** Entrepreneur–Types of Entrepreneurs, Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. Contributions of entrepreneurs to the society, risk-opportunities perspective and mitigation of risks. Opportunity Identification, factors determining competitive advantage, market segment, market structure, marketing research, Demand-supply analysis Developing an Effective Business Model, Legal forms of business.
3	**Total Quality Management** Basic concept of Total Quality Management and Principles. Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention. Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards Requirements—Implementation— Documentation Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001
4	**Material Management** Purchase Management-Purchase system (Centralized, Decentralized, Local purchase)-Purchase Procedures: -Selection of Suppliers-Tendering Procedures- Analyzing Bids-Price Store and store organization, Classification of material and inventory control. Store management, purchasing, organizing inventory, inventory control, Use of computer for effective store management
5	**Finance and Accounting** Cost Concepts and Classification, Material, Labor, Overhead, Cost Behavior Analysis, Preparation of Cost Sheets, Job Order Costing, Cost-Volume-Profit Analysis, Budgeting and Budgetary Control, Steps in the Recording Process, Journal, Ledger, Trial Balance, Worksheet, Preparation of Financial Statements Total Revenue, Total Cost and Profit, Opportunity Cost, The Production Function, Total-Cost Curve, Fixed and Variable Costs, Average
6	**Ergonomics and Biomedical Waste Management** Elements of fire-causes, Pollution, Waste management. Applied anthropometry, Human Work and Work Environment (HWWE), workspace design and seating, arrangement of components within a physical space, interpersonal aspects of work place design, design of repetitive task, design of manual handling task, work capacity, stress, and fatigue. Prosthetics & Orthotics laboratory waste disposal and Role of the state/municipality/corporation/Authorized state agencies in biomedical waste management
7	**Human Rights & Disaster Management** Human Rights of Disadvantaged People–Women, Children, Displaced persons and Disabled persons, including Aged. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO‘s, Media, Educational Institutions, Social Movements. Management of R &D and Innovations, IPR and patent. Definition: Disaster, Types of disaster Earthquake, Landslide, Flood, Drought, Fire etc. Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change.
8	**Occupational Safety & Health**: Health, Safety and Environment guidelines, legislations & regulations as applicable. Response to emergencies e.g.; power failure, fire, and system failure. Importance of housekeeping & good shop floor practices. Introduction to 5S concept & its application. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE) such as use of gloves and goggles. Basic understanding on Hot work, confined space work and material handling equipment.

9	**Professional ethics and conduct:** Appropriate code of ethical behavior of P & O Professionals and Rules of Professional Conduct as per RCI as well international standard

Reference Textbooks and Journals

Sl. No.	Author	Title	Publisher	Year/Vol.
1.	Ramakrishna	Essentials of Project Management	PHI	2010
2.	McGrath E.H.S.J	Basic Managerial Skills for All	PHI	2011
3.	Srinivasan, R	Strategic Management: The Indian Context	PHI	2014
4.	Datta A K	Materials Management, Procedures, Text and Cases"	PHI	1998
5.	Prof. L. C. Jhamb	Materials Management, Logistics Manageme Supply Chain Management , Operations Management,	Everest Publis House	2021
6.	Gopalakrishnan	Purchasing & Materials Management	(TMH) India	2022
7.	Dr Eugene F Brigham & C Micheal Ehrhardt	Financial Management: Theory and Practice	Cengage Publications	2015
8.	Brigham Houston	Fundamentals of Financial Management:	Cengage Publications	14th Edition
9.	George Samuel Clason	The Richest Man in Babylon	Pushpak Publications	2020
10.	Dave Ramsey	The Total Money Makeover: A Proven Plan f Financial Fitness		2024
11.	Brigham Houston	Fundamentals of Financial Management:		2024

Journals:

1. Strategic Management Journal
2. Journal of Management Studies
3. Journal of Quality Control and Management
4. Materials Management Review
5. The Journal of Finance

TITLE- Clinical Prosthetics and Orthotics Practice in Pediatric
COURSECODE--- BPO 451
TEACHING HOURS- 210
CREDITS---07

Course Description: This course is designed to provide students with the knowledge and skills required for clinical practice in the field of prosthetics and orthotics specifically tailored for pediatric patients. The course integrates theoretical principles, practical applications, and clinical experiences to prepare students for working with children who require orthotic or prosthetic devices.

Learning Objectives and Outcomes:

- **Comprehensive Understanding:**
  Students will acquire a comprehensive understanding of orthotic and prosthetic management tailored to pediatric populations.
- **Diagnostic Proficiency:**
  Students will develop diagnostic proficiency in assessing a range of musculoskeletal and neurological conditions relevant to orthotic and prosthetic interventions.
- **Prescription Competence:**
  Students will demonstrate competence in prescribing orthotic and prosthetic devices based on thorough assessments and diagnostic criteria.
- **Paediatric Specialization:**
  Students will be specialized in pediatric orthotic and prosthetic care, including assessment, evaluation, and management strategies.
- **Wound Care Proficiency:**
  Students will acquire proficiency in wound care techniques, particularly in the context of
  diabetes and pediatric foot care.
- **Preventive Strategies:**
  Graduates will develop preventive strategies for sports-related foot injuries and cardio- pulmonary deconditioning in geriatric patients.
- **Interdisciplinary Collaboration:**
  Students will understand the importance of interdisciplinary collaboration in providing holistic care to pediatric and geriatric populations.
- **Research and Innovation:**
  Students will be encouraged to engage in research activities, promoting innovation in orthotic and prosthetic care for pediatric and geriatric patients.

DETAILED CONTENTS

S.NO	TOPIC
1.	All types of prostheses, orthoses and assistive devices used in paediatric care.

Reference Books and Journals

Sl.No.	Author	Title	Publisher	Year/Vol.
1	Michael A. Alexander, I J. Mstthews	Pediatric Rehabilitation Pri and Practices	Springer Publishing Co I	2024
2	Hsu, John D.	AAOS atlas of Orthosis an assistive devices,	Mosby publications	5th ed.
3	Michelle M. Lusardi PhD PT andCaroline C. Nielsen PhD	Orthotics and Prosthetics i Rehabilitation	Saunders	4th ed.
4	Michael A. Alexander , Dennis J. Matthews	Pediatric Rehabilitation	Springer Publishing Co I	5th
5	Albert M. Cook,Jaan Miller Polgar,Pedro Encarr	Assistive Technologies	Mosby	5th ed.
6.	R Chinnathurai	Short Textbook of Prosthet Orthotics		1st ed.
7.	Douglas Murphy	Fundamentals of Amputati Care And Prosthetics		1st ed.

TITLE- Clinical Prosthetics and Orthotics Practice in Podiatric, Sports and Diabetic Conditions
COURSE CODE--- BPO 452
TEACHING HOURS- 240
CREDITS --- 08

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 be able to:

- Develop Comprehensive understanding of podiatric, sports-related, and diabetic foot conditions and their impact on mobility and function.
- Foster effective communication and collaboration within interdisciplinary healthcare teams to optimize patient outcomes.
- Acquire advanced skills in the assessment, prescription, fabrication, and fitting of prosthetic and orthotic devices for individuals with foot-related conditions.
- Enhance clinical reasoning and decision-making abilities through case-based learning and practical exercises.
- Assessment and prescription.
- Clinical provision of prostheses and orthoses.
- Designing of prostheses and orthoses.
- Interpersonal relationships.
- Organization and management.
- Clinical research.
- Contributing too and learning from the clinic team.
- Promote evidence-based practice through critical appraisal of current literature and research in the field of clinical prosthetics and orthotics.

S.NO	TOPIC
1.	Assessment, fabrication, fitment and delivery of different types of orthoses for different foot pathologies
2	Assessment, fabrication, fitment and delivery of different types of orthoses for diabetic foot condition and anesthetic foot
3	Orthotic Assessment and Prescription: assessment and evaluation of individuals with podiatric, sports, and diabetic foot conditions. Discussion of orthotic options, including custom foot orthoses, ankle-foot orthoses (AFOs), and footwear modifications. Consideration of patient-specific factors, functional goals, and biomechanical principles in orthotic prescription.
4	Orthotic interventions in sports related injuries
5	Specialized Prosthetic intervention in sports
6	Prosthetic intervention in Diabetic amputation

TITLE----- Digital Technology in Prosthetics and Orthotics
COURSE CODE--- BPO 453
TEACHING HOURS- 210
CREDITS --- 07

Course Description: This course explores the integration of digital technology into the field of prosthetics and orthotics. Students will examine the latest advancements in digital tools, techniques, and devices that enhance the design, fabrication, and fitting processes in the creation of prosthetic and orthotic devices. The course will cover a range of topics from digital scanning and modeling to the use of robotics and smart materials, providing a comprehensive understanding of the impact of technology on modern prosthetic and orthotic practices.

Learning Objectives:

- Explain the historical context and evolution of digital technology in the field of prosthetics and orthotics.
- Demonstrate proficiency in using 3D scanning and imaging technologies for capturing accurate anatomical data.
- Create, modify, and optimize digital models for customized prosthetic and orthotic devices
- Interpret and troubleshoot digital scans to ensure quality data acquisition
- Select appropriate materials and optimize designs for digital fabrication processes.
- Use VR and AR tools for design visualization and patient interaction in prosthetics and orthotics
- Analyze digital data to inform personalized device customization.
- Apply HMI principles for user-friendly device control
- Design prosthetic and orthotic interfaces that optimize user experience.

DETAILED CONTENTS

S.NO	TOPIC
1.	**3D Scanning and Printing:** Utilization of computer-aided design (CAD) software to modify and optimize digital models. Printing prototypes of prosthetic and orthotic comp using 3D printers
2	Design and manufacture prosthetic and orthotic devices using CAD/CAM technology. Integration of CAD models with CAM systems for precise manufacturin

TITLE----- Project Work
COURSE CODE--- BPO 454
TEACHING HOURS- Practical (240)
CREDITS --- 08

Each Trainee/group (max. 2 to 3 students) shall take a project work under t h e supervision of a guide. Project work has to be well documented and presented in essay form or as per the guidelines of the respective university. The major focus will be the trainee‘s original work which she or he has to present before the final examination. The subject and the guide should be chosen within four weeks from the date of admission/promotion to the fourth year.

Appendix-I

AREAS OF RESPONSIBILITY PERFORMED BY ORTHOTIC AND PROSTHETIC PROFESSIONALS IN PATIENT CARE

Patient Assessment

Perform a comprehensive assessment of the patient to obtain an understanding of the patient 's orthotic/prosthetic needs:

☛ Take a comprehensive patient history, including demographic characteristics, family dynamics, previous use of an orthosis/prosthesis, diagnosis, work history, avocational activities, signs and symptoms, medical history (including allergies to materials), reimbursement status, patient expectations, results of diagnostic evaluations.

☛ formulate the treatment plan by performing a diagnosis-specific functional clinical examination, including manual muscle testing, gait assessment and evaluation of sensory function, cognitive ability, range of motion, joint stability, skin integrity and compliance.

☛ Consult with other health care professionals and caregivers about patient's condition to assist in formulating a treatment plan.

☛ Communicate with patient and/or caregiver about the recommended treatment plan, and any optional plans, to involve them in orthotic or prosthetic care; include disclosure of potential risks/benefits.

☛ Verify patient care by documenting history, ongoing care and follow-up, using established record-keeping techniques.

☛ Refer patient, if appropriate, to other health care professionals (e.g., psychologist, therapist, physician) for intervention beyond orthotic/prosthetic scope of practice.

Formulation of the Treatment Plan

Create a comprehensive orthotic/prosthetic treatment plan to meet the needs and goals of the patient:

☛ Evaluate the findings to determine an orthotic/prosthetic recommendation.

☛ Formulate treatment goals and expected orthotic/prosthetic outcomes to reduce pain/increase comfort, enhance function and independence, provide stability, prevent deformity, address cosmesis and/or promote healing.

☛ Consult with referral source to modify, if necessary, the original prescription and/or treatment plan.

☛ Identify material, design and components to support anticipated outcome.

☛ Develop a plan for patient needs, including patient education and follow-up.

☛ Document treatment plan using established record-keeping techniques to verify patient care.

☛ Inform patient or responsible parties of their financial responsibilities, pertaining to proposed treatment plan.

Implementation of the Treatment Plan

Perform the necessary procedures to deliver the appropriate orthotic/prosthetic services, which may include fabrication of the orthosis/prosthesis:

☛ Inform patient, family and/or caregiver of the orthotic/prosthetic procedure, possible risks and time involved in the procedure.

☛ Select appropriate material/techniques to implement treatment plan.

☛ Provide patient with preparatory care for orthotic/prosthetic treatment (e.g., diagnostic splint, residual limb shrinker).

☛ Prepare patient for procedure required to initiate treatment plan (e.g., take impression, digitize, delineate, scan).

☛ Implement procedures (e.g., take impression, digitize, delineate, scan).

☛ Select appropriate materials, components and specifications for orthosis/prosthesis based on patient criteria to ensure optimum strength, durability and function as required (e.g., choose ankle or knee joints, feet, knee units; choose material of components, lamination layups).

☛ Consult technical component/material resources as required.

☛ Prepare delineation/impression/template for modification/fabrication (e.g., prepare impression/reverse delineation, seal and fill impression/pour cast, digitize, strip model, download shape to carver or modification software).

☛ Modify and prepare patient model for fabrication.

☛ Fabricate/assemble prescribed device by assembling selected materials/components to prepare for fitting and/or delivery (e.g., laminate/vacuum-form, remove socket/orthosis from model, smooth and finish orthosis/prosthesis, contour side bars to model/delineation, smooth and finish side bars, bench align components to socket, strap orthosis/prosthesis as necessary, perform final assembly of orthosis/prosthesis for patient fitting/delivery).

☛ Assess device for structural safety and ensure that manufacturers' guidelines have been followed prior to patient fitting/delivery (e.g., torque values, patient weight limits).

☛ Assess/align orthosis/prosthesis for accuracy in sagittal, transverse and coronal planes to provide maximum function/comfort.

☛ Provide gait training/functional-use training.

☛ Ensure that materials, design and components are fit/delivered as prescribed.

☛Complete fabrication process after achieving optimal fit of orthosis/prosthesis (e.g., convert test socket to definitive orthosis/prosthesis).

☛ Educate/counsel patient and/or caregiver about the use and maintenance of the orthosis/prosthesis (e.g.,

wear schedules, therapy, other instructions).

☛ Reassess orthosis/prosthesis for structural safety prior to patient delivery (e.g., screws tightened, cover attached).

☛ Document treatment using established record-keeping techniques to verify implementation of treatment plan.

Follow-up Treatment Plan

Provide continuing patient care and periodic evaluation to assure/maintain/document optimal fit and function of the orthosis/prosthesis:

☛ Solicit subjective feedback from patient and/or caregiver to determine status (e.g., wear schedule/tolerance, comfort, perceived benefits, perceived detriments, ability to don and doff, proper usage and function, overall patient satisfaction).

☛ Assess patient‘s functional level.

☛ Assess patient‘s skin condition (e.g., integrity, color, temperature, volume).

☛ Assess patient‘s general health, height, and weight, and note any changes.

☛ Assess patient‘s psychosocial status, and note any changes (e.g., family status, job, caregiver).

☛ Assess fit of orthosis/prosthesis with regard to strategic contact (e.g., three-point force systems, total contact) to determine need for changes relative to initial treatment goals.

☛ Assess fit of orthosis/prosthesis with regard to anatomical relationships to orthosis/prosthesis (e.g., trimlines, static/dynamic alignment) to determine need for changes relative to initial treatment goals.

☛ Formulate plan to modify orthosis/prosthesis based on findings; inform patient and/or caregiver of plan to modify orthosis/prosthesis.

☛ Make or delegate modifications to orthosis/prosthesis (e.g., relieve pressure, change range of motion, change alignment, change components, add pressure-sensitive pad).

☛ Assess modified device for structural safety, and ensure that manufacturers' guidelines (e.g., torque values, patient weight limits) have been followed.

☛ Evaluate modifications to orthosis/prosthesis, including static and dynamic assessment to confirm that goals and objectives of modifications have been met.

☛ Reassess patient knowledge and understanding of goals and objectives to ensure proper use of orthosis/prosthesis relative to modifications.

☛ Document all findings and actions and communicate with appropriate health care professionals (e.g., referral sources, colleagues, supervisor) to ensure patient status is updated.

Practice Management

Develop, implement and/or monitor policies and procedures regarding human resource management, physical environment management, business/financial management and organizational management:

☛ Plan, implement, evaluate and document policies and procedures in compliance with all applicable federal and state laws and regulations as well as professional and ethical guidelines.

☛ Develop and implement personnel policies and procedures (e.g., benefits, training, incentives, staff recognition, regular performance appraisals).

☛ Establish procedures for patient care that comply with accepted medical/legal requirements, and maintain current education in those areas.

☛ Demonstrate proper documentation of patient history and financial records by using established record- keeping techniques to verify patient care and other pertinent information.

☛ Communicate roles and expectations of employer and employees by providing documentation to create a professional, cooperative working environment and improve patient care.

☛Promotion of Competency and Enhancement of Professional Practice

☛Participate in personal and professional development through continuing education, training, research and organizational affiliations:

☛ Participate in continuing education and/or provide such education for other health care professionals, orthotic and prosthetic professionalss, assistants, technicians, fitters and office staff (e.g., publications, seminars, case studies).

☛ Participate in education for residents, students and trainees.

☛ Conduct or participate in product development research, clinical trials and outcome evaluation studies.

☛ Participate in the development, implementation and monitoring of public policy regarding orthotics/prosthetics (e.g., provide testimony/information to legislative/ regulatory bodies, serve on professional committees and regulatory agencies).

☛ Participate in/with consumer organizations and nongovernmental organizations to promote competency and enhancement of orthotic/prosthetic profession.

Appendix-II

CODES OF ETHICS FOR PROSTHETICS AND ORTHOTICS PROFESSIONALS

The Code sets forth the minimal ethical standards of professional conduct for Prosthetic and Orthotic Professionals. The Code is designed to provide both appropriate ethical practice guidelines and enforceable standards of conduct for all Prosthetics and orthotics Professionals. The Code also serves as a professional resource for orthotic and prosthetic practitioners in the case of a possible ethical violation.

General Guidelines

As set forth in this Code of Ethics candidates are expected to protect patient interests, and to act in an appropriate manner, which promotes the integrity of, and reflects positively on, the practitioner, the council, and the profession, consistent with accepted moral, ethical, and legal standards.

Generally, a candidate/professional has the obligation to:

1. Treat all patients fairly and in a timely manner;
2. Provide quality services to patients, by utilizing all necessary professional resources in a technically appropriate and efficient manner, and by considering the cost-effectiveness of treatments;
3. Respect and promote the rights of patients by offering only professional services that he/she is qualified to perform, and by adequately informing patients about the nature of their conditions, the objectives of the proposed treatment, treatment alternatives, possible outcomes, and the risks involved;
4. Maintain the confidentiality and privacy of all patient information, unless: the information pertains to illegal activity; the patient expressly directs the release of specific information; or, a court or government agency lawfully directs the release of the information;
5. Avoid conduct which may cause a conflict with patient interests, and disclose to patients any circumstances that could be construed as a conflict of interest or an appearance of impropriety, or that could otherwise influence, interfere with, or compromise the exercise of independent professional judgment;
6. Engage in moral and ethical business practices, including accurate and truthful representations concerning professional information; be truthful with regard to research sources, findings, and related professional activities;
7. Maintain accurate and complete records; respect the intellectual property and contributions of others; and, further the professionalism of orthotic, prosthetic, and habilitative services.

SECTION A: COMPLIANCE WITH LAWS, POLICIES, AND RULES RELATING TO THE PROFESSION

The professional will be aware of, and comply with, all applicable federal, state, and local laws and regulations governing the profession. He will not knowingly participate in, or assist, any acts that are contrary to applicable professional laws and regulations.

The professional will be aware of, and comply with, all council rules, policies, and procedures, including rules concerning the appropriate use of council certification marks and the proper representation of council credentials. The professional will not knowingly participate in, or assist, any acts that are contrary to council rules, policies, and procedures.

The professional will make all reasonable and appropriate efforts to promote compliance with, and awareness of, all applicable laws, regulations, and council rules and policies governing the profession.
The professional will make all reasonable and appropriate efforts to prevent violations of applicable laws, regulations, and council rules and policies governing the profession.

The professional will provide accurate and truthful information to council concerning all certification related eligibility information, and will submit valid application materials for fulfillment of current certification and recertification requirements.

The professional will report possible violations of this Code of Ethics to the appropriate council representative(s).

The professional will cooperate fully with the council concerning the review of possible ethics violations and the collection of related information.

Lack of awareness or misunderstanding of these laws and regulations does not excuse inappropriate or unethical behavior.

SECTION B: PROFESSIONAL PRACTICE

The professional will deliver competent services in a timely manner, and will provide quality patient care applying appropriate professional skill and competence.
The professional will recognize the limitations of his/her professional ability, and will only provide and deliver professional services for which he/she is qualified. He will be responsible

for determining his/her own professional abilities based on his/her education, knowledge, competency, credentials, extent of practice experience in the field, and other relevant considerations.

The professional will adequately inform patients about the nature of their conditions, the objectives of proposed services, alternatives, possible outcomes, and the risks involved, and will discuss these concerns with each patient in sufficient detail.

The professional will use all health-related resources in a technically appropriate and efficient manner.

The professional will provide services based on patient needs and cost-effectiveness considerations, and will avoid unnecessary services. He will provide services that are both appropriate and necessary to the condition of the patient.

The professional will exercise diligence and thoroughness in providing patient services, and in making professional assessments and recommendations solely for the patient‘s benefit, free from any prejudiced or biased judgment. The professional who offers his/her services to the public will not decline a patient based on age, gender, race, color, national origin, disability, religious affiliation, or any other basis that would constitute unlawful discrimination.

The professional will monitor each patient‘s physical condition in an appropriate manner, including any improvements or deterioration, and will review changes in condition with the patient.

When it is determined that the professional is unable to provide competent professional services, he/she will inform the patient accordingly; and, will ensure careful transition of patient care by providing appropriate professional referrals and other appropriate assistance.

When the patient chooses to terminate services provided by a professional, the professional will cooperate with the patient concerning the release of medical information, consistent with directions and authorization provided by the patient or patient‘s legal guardian.

The professional will prepare and maintain all necessary, required, or otherwise appropriate records concerning his/her professional practice, including complete and accurate patient services records.

When appropriate, or when requested by the patient, the professional will consult with other qualified health care professionals.

The professional will not delegate the responsibility to provide professional services to an unqualified person. Where supervision is appropriate and necessary, the professional will not delegate responsibility for the provision of professional services without providing appropriate supervision.

The professional will not act in a manner that may compromise his/her clinical judgment or obligation to deal fairly with all patients. He will not allow medical or psychological conditions, personal issues, substance abuse, or other matters to interfere with his/her professional judgment or performance.

The professional will be truthful and accurate in all advertising and representations concerning qualifications, experience, competency, and performance of services, including representations related to professional status and/or areas of special competence. He will not make false or deceptive statements

concerning clinical training, experience, competence, academic training or degrees, certification or credentials, institutional or association affiliations, services, or fees for services.

18. The professional will not make false or misleading statements about, or guarantees concerning, any service or the efficacy of any prosthetic or orthotic device, orally or in writing.

SECTION C: RESEARCH AND PROFESSIONAL ACTIVITIES

The professional will be accurate and truthful, and otherwise act in an appropriate manner, with regard to research findings and related professional activities, and will make reasonable and diligent efforts to avoid any material misrepresentations.

The professional who participates or engages in a research project or study will obtain written, informed consent, as appropriate, from all involved parties.

The professional will maintain appropriate, accurate, and complete records with respect to patient consent, research findings, and related professional activities.

When preparing, developing, or presenting research information and materials, the professional will not copy or use, in substantially similar form, materials prepared by others without acknowledging the correct source and identifying the name of the author and/or publisher of such material.

The professional will respect and protect the intellectual property rights of others, and will otherwise recognize the professional contributions of others.

SECTION D: CONFLICT OF INTEREST AND APPEARANCE OF IMPROPRIETY

The professional will not engage in conduct that may cause an actual or perceived conflict between his/her own interests and the interests of his/her patient. He will avoid conduct that causes an appearance of impropriety.

The professional will act to protect the interests and welfare of the patient before his/her own interests, unless such action is in conflict with any legal, ethical, or professional obligation. He will not exploit professional relationships for personal gain.

The professional will disclose to patients any circumstance that could be construed as a conflict of interest or an appearance of impropriety, or that could otherwise influence or interfere with the exercise of professional judgment.

The professional will refrain from offering or accepting inappropriate payments, gifts, or other forms of compensation for personal gain, unless in conformity with applicable laws, regulations, and council rules and policies.

The professional will avoid conduct involving inappropriate, unlawful, or otherwise unethical monetary

gain.

SECTION E: COMPENSATION AND REFERRAL DISCLOSURES

The professional will charge fair, reasonable, and appropriate fees for all professional services, and will provide third party payers with truthful and accurate information concerning such services.
The professional will charge fees that accurately reflect the services and treatment provided to the patient. When setting fees, the professional will consider: the length of time he/she has been practicing in this particular field; the amount of time necessary to perform the service; the nature of the patient‘s condition; his/her professional qualifications and experience; and, other relevant factors.
The professional will make all appropriate disclosures to patients and prospective patients regarding any benefit paid to others for recommending or referring his/her services.
The professional will make all appropriate disclosures to patients and prospective patients regarding any benefit received for recommending or referring the services of another individual.

SECTION F: PATIENT CONFIDENTIALITY AND PRIVACY

The professional will maintain and respect the confidentiality of all patient information obtained in the course of a professional relationship, unless: the information pertains to illegal activity; the patient or the patient‘s legal guardian expressly directs the release of specific information by providing prior, written consent; or, a court or government agency lawfully directs the release of the information.
The professional will respect and maintain the privacy of his/her patients.

SECTION G: MISCONDUCT PROHIBITIONS

The professional will not engage in any criminal misconduct.
The professional will not engage in any sexual, physical, romantic, or otherwise intimate conduct with a current patient or with a former patient within two years following the termination of the patient relationship.
The professional will not engage in conduct involving dishonesty, fraud, deceit, or misrepresentation in professional activities.
The professional will not engage in unlawful discrimination in professional activities.
The professional will avoid any behavior clearly in violation of accepted moral, ethical, or legal standards that may compromise the integrity of, or reflect negatively on, the profession.

Commitment to professional excellence

The professional will execute professionalism to reflect in his/her thought and action a range of attributes and characteristics that include technical competence, appearance, image, confidence level, empathy, compassion, understanding, patience, manners, verbal and non- verbal communication, an anti-discriminatory and non-judgmental attitude, and appropriate physical contact to ensure safe, effective and expected delivery of healthcare. He will;

Demonstrate distinctive, meritorious and high-quality practice that leads to excellence and that depicts commitment to competence, standards, ethical principles and values, within the legal boundaries of practice Demonstrate the quality of being answerable for all actions and omissions to all, including service users, peers, employers, standard-setting/regulatory bodies or oneself

Demonstrate humanity in the course of everyday practice by virtue of having respect (and dignity), compassion, empathy, honour and integrity

Ensure that self-interest does not influence actions or omissions, and demonstrate regards for service-users and colleagues

Leadership and mentorship

The professional must take on a leadership role where needed in order to ensure clinical productivity and patient satisfaction. They must be able to respond in an autonomous and confident manner to planned and uncertain situations, and should be able to manage themselves and others effectively. They must create and maximize opportunities for the improvement of the health seeking experience and delivery of healthcare services. He will act as agents of change and be leaders in quality improvement and service development, so that they contribute and enhance people ‘s wellbeing and their healthcare experience.

Systematically evaluate care; ensure the use of these findings to help improve people ‘s experience and care outcomes, and to shape clinical treatment protocols and services

Identify priorities and effectively manage time and resources to ensure the maintenance or enhancement of the quality of care

Recognize and be self-aware of the effect their own values, principles and assumptions may have on their practice. They must take charge of their own personal and professional development and should learn from experience (through supervision, feedback, reflection and evaluation)

Facilitate themselves and others in the development of their competence, by using a range of professional and personal development skills

Work independently and in teams. They must be able to take a leadership role to coordinate, delegate and supervise care safely, manage risk and remain accountable for the care given; actively involve and respect

others ‘contributions to integrated person- centered care; yet work in an effective manner across professional and agency boundaries. They must know when and how to communicate with patients and refer them to other professionals and agencies, to respect the choices of service users and others, to promote shared decision-making, to deliver positive outcomes, and to coordinate smooth and effective transition within and between services and agencies.

Social Accountability and Responsibility

The professional will recognize that allied health professionals need to be advocates within the health care system, to judiciously manage resources and to acknowledge their social accountability. They have a mandate to serve the community, region and the nation and will hence direct all research and service activities towards addressing their priority health concerns. He will demonstrate knowledge of the determinants of health at local, regional and national levels and respond to the population needs

Establish and promote innovative practice patterns by providing evidence-based care and testing new models of practice that will translate the results of research into practice, and thus meet individual and community needs in a more effective manner

Develop a shared vision of an evolving and sustainable health care system for the future by working in collaboration with and reinforcing partnerships with other stakeholders, including academic health centres, governments, communities and other relevant professional and non-professional organizations

Advocate for the services and resources needed for optimal patient care Scientific attitude and Scholarship

The professional will utilize sound scientific and/or scholarly principles during interactions with patients and peers, educational endeavors, research activities and in all other aspects of their professional lives. He will engage in ongoing self-assessment and structure their continuing professional education to address the specific needs of the population

Practice evidence-based treatment by applying principles of scientific methods Take responsibility for their educational experiences

Acquire basic skills such as presentation skills, giving feedback, patient education and the design and dissemination of research knowledge; for their application to teaching encounters

Lifelong learning

The professional should be committed to continuous improvement in skills and knowledge while harnessing modern tools and technology. He will:

Perform objective self-assessments of their knowledge and skills; learn and refine existing skills; and acquire new skills

Apply newly gained knowledge or skills to patient care

Enhance their personal and professional growth and learning by constant introspection and utilizing experiences

Search (including through electronic means), and critically evaluate medical literature to enable its application to patient care

Develop a research question and be familiar with basic, clinical and translational research in its application to patient care

Identify and select an appropriate, professionally rewarding and personally fulfilling career pathway

APPENDIX-III CREDENTIALING

Currently Rehabilitation Council of India registers the prosthetics and orthotics professionals/ Personnel in their central rehabilitation Register in Professional and personnel category. The candidates who possess undergraduate and/ or Post Graduate degree are registered as Prosthetist and Orthotist in professional category. The candidate who possesses diploma or certificate level education through RCI recognized Institutions are registered under Personnel category as a Prosthetic and Orthotic technician.

RCI credentialed individuals must obtain mandatory continuing education credits to maintain their certification/registration at a five-year renewal cycle. They are also bound by a code of ethical conduct that provides a framework for professional conduct in consideration of the patient, allied health colleagues and the profession.

RCI credentialing requirements were established to maintain improved quality of care, assure patient safety and promote the appropriate utilization of orthotic and prosthetic services.

ORTHOTIC AND PROSTHETIC PATIENT CARE AND SERVICE PROVIDERS ORTHOTIST AND/OR PROSTHETIST

An orthotist or prosthetist is a healthcare professional and registered under RCI Central Rehabilitation Register as ―Professional‖ who is specifically trained and educated to manage the provision of comprehensive orthotic and prosthetic care, based upon a clinical assessment, to restore physical function and/or cosmesis.

The P&O professionals independently provide or supervise the provision of comprehensive orthotic and prosthetic care. This includes patient assessment, formulation of a treatment plan/prescription, implementation of the treatment plan, follow-up and practice management

PROSTHETICS AND ORTHOTICS TECHNICIAN

A P&O technician is an individual registered under RCI Central Rehabilitation Register as ―Personal who supports the P&O Professionals by providing the technical implementation tasks and services associated with the support of patient care. Under the supervision of and in consultation with the professionals, the registered technician fabricates repairs and maintains devices to provide maximum fit, function and cosmesis. The registered technician is expected to keep abreast of all new fabricating techniques must be familiar with the properties of pertinent materials and must be skilled in the use of appropriate equipment.

P&O technicians may not use their credentials as independent professionals engaged in direct patient care. The registered technician is obligated to support and conform to professional responsibilities that promote and assure the overall welfare of the patient and the integrity of the profession.