GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160310
Semester – VI
Rehabilitation Engineering

Type of course: Professional Elective Course - I

Prerequisite: Human Anatomy & Physiology, Design Concept Fundamentals, Electronics

Rationale: Purpose to learn the basic concepts of rehabilitation engineering and assist devices and to understand the importance of biomedical engineering in rehabilitation.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	Weightage %
1	**Introduction & Principle of Rehabilitation Engineering:** Definition of Rehabilitation, Epidemiology of Rehabilitation, Levels of Health Prevention, Preventive Rehabilitation, Diagnosis of Disability and Functionality of body organs, relation between Impairment, disability, handicap, Primary & secondary Disabilities, Rehabilitation team: Classification of members & their roles. The Human Component in rehabilitation engineering, Principles of Assistive Technology Assessment, MODELS of Rehabilitation Engineering, Principles of Rehabilitation Engineering, Goals of Rehabilitation.	08	15%
2	**Prosthetic & Orthotic Engineering:** Anatomy of upper & lower extremities - Classification of amputation types, Prosthesis prescription - Components of upper limb prosthesis - Fabrication of prosthesis - Components of lower limb prosthesis, different types of models for externally powered limb prosthetics, Criteria for design of prosthesis. Orthosis and its basic classification, Traumatic injuries of upper extremities, Air splints for traumatic injuries, Dynamic splints for RN palsy, cervical orthosis, Types of cervical orthosis, Osteoarthritis, Various levels of osteoarthritis, Knee brace for Knee OA, Polio and level of severity of polio, Calipers for polio, Ankle Foot Orthosis, Knee Ankle Foot Orthosis.	12	25%

3	**Mobility Aid in Rehabilitation Engineering:** **Electronic Travel Appliances (ETA):** Path Sounder, Laser Cane, Ultrasonic Torch, Sonic Guide, Light Probes, Nottingham Obstacle Sensors, Electro cortical Prosthesis, Electro Roftalam, Polarized Ultrasonic Travel aids. Classification of wheelchairs, Materials used for wheelchairs, Types of Wheelchairs, Structure and design aspects and criteria of wheel Chair, Propulsion Systems, Wheelchair Standards and Assessment of Wheelchairs, Working of Electric Power Wheelchairs, Tricycle, Walkers, Crutches.	09	20%
4	**Rehabilitation of Sensory organs:** Fundamentals of Sensory Substitution and Augmentation, Basic Anatomy of Eye, Types of Visual Impairments, Braille Reader, Tactile devices for visually challenged, Text voice converter, screen readers. Anatomy of ear – hearing functional assessment, Types of deafness - Surgical and non-surgical hearing aids, Cochlear implants - Assistive technology solutions for hearing disability with Tactile sensors, Working of Speech Trainer.	10	25%
5	**Application of Rehabilitation in various fields** Computer applications in Rehabilitation Engineering, Brain computer Interface (BCI), Neuro-prosthesis, Application of robotics in Rehabilitation Engineering, Sports in Rehabilitation Engineering, Working operation of GAIT trainer.	06	15%
	Total	**45**	**100%**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10%	25%	30%	25%	10%	0%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Reference Books:

1. TextBook of Rehabilitation, 3rd Edition, S. Sunder, Jaypee Publication
2. An Introduction to Rehabilitation Engineering, Rory A. Cooper et. al, Taylor & Francis
3. Joseph D.Bronzino , The Biomedical Engineering Handbook Volume-II, Second Edition, CRC Press 2006
4. Orthotics and Prosthetics in Rehabilitation, 4th Edition, Kevin K. Chui et. al, Elsevier

5. Robinson C.J., Rehabilitation Engineering Handbook of Electrical Engineering, CRC Press, Bocaration 1993
6. Rehabilitation Engineering Applied to Mobility and Manipulation, Rory A. Cooper, Institute of Physics Publishing

Course Outcomes:

At the end of this course students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand fundamental concepts of Rehabilitation Engineering	15%
CO-2	Classify various Orthotic and Prosthetic Devices and understand its application	25%
CO-3	Understand various types of Mobility Aids	20%
CO-4	Summarize various Assistive Technologies for Auditory, Visual and Speech disabilities	25%
CO-5	Illustrate application of Rehabilitation Engineering in Healthcare society	15%

Suggested List of Experiments/Study Practical:

1. To study fundamental concepts of Rehabilitation Engineering
2. To study elements and various models of Rehabilitation Engineering
3. To study components of Upper Limb Prosthesis and its design aspects
4. To study components of Lower Limb Prosthesis and its design aspects
5. To study and classify various orthotic devices for upper and lower limb \
6. To study various mobility aids for vision related disability
7. To study wheel chair classification and its design aspects
8. To study various augmentative/substitutive device for hearing disability
9. To study various augmentative/substitutive device for speech and vision disabilities
10. To study advance application of Rehabilitation Engineering