

23BME13

REHABILITATION ENGINEERING

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COURSE OBJECTIVES

- To explain the need and scope of medical aids and rehabilitation services.
- To provide an understanding of sensory augmentation and substitution systems.
- To introduce the principles and applications of orthopaedic prosthetics and orthotics.
- To explore the role of virtual reality and robotic technologies in rehabilitation.
- To develop awareness of rehabilitation medicine and advocacy for people with disabilities.

UNIT-I INTRODUCTION TO REHABILITATION 9

Definition - Impairments, disabilities and handicaps, Primary and secondary disabilities, Activities of daily living, Appropriate Technology, Residual function. Rehabilitation. Rehabilitation team – members and their functions. Rehabilitation care –Need for proper delivery of rehabilitation care, Community based rehabilitation and its aspects.

UNIT-II ENGINEERING CONCEPTS IN SENSORY AUGMENTATION AND SUBSTITUTION 9

Sensory augmentation and substitution- Visual system: Visual augmentation, Tactual vision substitution, and Auditory vision substitution. Auditory system- Auditory augmentation, Hearing aids, cochlear implants, visual auditory substitution, tactual auditory substitution. Tactual system - Tactual augmentation, Tactual substitution

UNIT-III ORTHOPEDIC PROSTHETICS AND ORTHOTICS 9

Engineering concepts in motor rehabilitation, Artificial limbs- body powered, externally powered and controlled orthotics and prosthetics, Myoelectric hand and arm prosthetics. Functional Electrical Stimulation systems-Restoration of hand function, restoration of standing and walking, Hybrid Assistive Systems (HAS).

UNIT-IV VIRTUAL REALITY 9

Introduction to virtual reality, Virtual reality based rehabilitation, Hand motor recovery systems with Phantom haptics, Robotics and Virtual Reality Applications in Mobility Rehabilitation.

UNIT-V REHABILITATION MEDICINE AND ADVOCACY 9

Psychological aspects of function recovery, psychological aspects of rehabilitation therapy, Legal aspect available in choosing the device and provision available in education, job and in day to day life.

TOTAL : 45 PERIODS

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

- C01** Describe the types of impairments, disabilities, rehabilitation care models, and the role of the rehabilitation team.
- C02** Explain sensory rehabilitation techniques and systems for visual, auditory, and tactual augmentation and substitution.
- C03** Identify various prosthetic and orthotic devices and evaluate their application in motor rehabilitation.
- C04** Analyze the use of virtual reality and robotics in physical and mobility rehabilitation.
- C05** Discuss key aspects of rehabilitation medicine, community-based care, and advocacy for disability rights.

TEXT BOOKS:

1. Christopher M. Hayre , Dave J. Muller , Marcia J. Scherer , Virtual Reality in Health and Rehabilitation, CRC Press, 2023.
2. Joseph D Bronzino, "The Biomedical Engineering Handbook". 2nd edition, CRC Press, 2000.
3. Robinson C.J, "Rehabilitation Engineering", CRC Press, 2006.

REFERENCE BOOKS:

1. Sashi S Kommu, "Rehabilitation Robotics", 1st edition, CRC Press, 2007.
2. Sunder, "Textbooks of Rehabilitation", Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi, 2nd Edition, Reprint 2007.
3. Horia- Nocholai Teodorecu, L.C.Jain, "Intelligent systems and technologies in rehabilitation Engineering", CRC; December 2000.
4. Etienne Grandjean, Harold Oldroyd, "Fitting the task to the man", Taylor & Francis, 1988.

E-RESOURCES:

1. <https://nptel.ac.in/courses/105105213/>

CO's – PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	1	1	-	-	1	-	1	-	-	-	-	1	-	3
C02	3	1	1	-	-	1	-	1	-	-	-	-	1	-	3
C03	3	1	1	-	-	1	-	1	-	-	-	-	1	-	3
C04	3	1	1	-	-	1	-	1	-	-	-	-	1	1	3
C05	3	1	1	-	-	1	-	1	-	-	-	-	1	1	3
AVG	3	1	1	-	-	1	-	1	-	-	-	-	1	1	3

1 - low, 2 - medium, 3 - high, '-' - no correlation