Program : **Diploma in Biomedical Engineering**	
Course Code : **4241**	Course Title: **Therapeutic Equipment**
Semester : **4**	Credits: **4**
Course Category: **Program Core**	
Periods per week: **4 (L:3, T:1, P:0)**	Periods per semester: **60**

Course Objectives:

- Introduce the different types of therapeutic equipment used in the medical field.
- Impart a thorough knowledge in the principle and operation of ICU and Operation theatre equipment
- Give an account of the principle, working and applications of surgical instruments.

Course Prerequisites:

Topic	Course code	Course name	Semester
Anatomy and Physiology of the human body		Basic Medical Science	3

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Identify the types of cardiac pacemakers, defibrillators and electrical stimulators.	15	Understanding
CO2	Explain the principle and working of instruments for surgery, Dialysis and lithotripsy.	13	Understanding
CO3	Summarize the principle and operation of the ICU and operation theatre equipment.	15	Understanding
CO4	Describe the working of drug delivery systems, endoscopy systems and radiotherapy unit.	15	Understanding
	Series Test	2	

CO - PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2						
CO2	2						
CO3	2						
CO4	2						

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Identify the types of cardiac pacemakers, defibrillators and electrical stimulators.**		
M1.01	Describe the types of pacemakers, their principle and working	6	Understanding
M1.02	Identify the types of defibrillators, their principle and working.	6	Understanding
M1.03	Explain pain relief through electrical stimulation and types of electrical stimulators.	3	Understanding
Contents: Cardiac pacemakers - design requirements - Power sources - Pacing modes - Working of ventricular synchronous demand pacemaker -Programmable pacemaker (block diagram and description). Defibrillators - Principle - working and output waveforms of DC defibrillators - Defibrillator with synchronizer - cardioverter -Automatic Implantable Defibrillators (block diagram and working) Electrical stimulators - Principle - different types of electrical stimulators - TENS- Spinal Cord Stimulator - Magnetic stimulation			
CO2	**Explain the principle and working of instruments for surgery, Dialysis and lithotripsy.**		
M2.01	Explain the principle and working of surgical diathermy unit.	4	Understanding
M2.02	Classify Lithotripters based on their principle and working.	5	Understanding
M2.03	Describe dialysis and the working of heamodialyzers	4	Understanding
	Series Test - I	1	

Contents:

Surgical diathermy -Working principle - modes of operation(schematic diagram and waveforms) - block diagram and working of ESU

Lithotripsy - Principle - operation of extra corporeal shock wave lithotripter and ultrasonic lithotripter with schematic

Dialysis - Principle - types of dialyzers (parallel flow, hollow fibre and coil type) - heamodialysis machine principle and working with block diagram

CO3	**Summarize the principle and operation of the ICU and operation theatre equipment.**		
M3.01	Summarize the terminologies related to artificial Respiration and the types of ventilators.	6	Understanding
M3.02	Explain the principle and working of anesthesia machine	4	Understanding
M3.03	Identify the need for cardiopulmonary bypass.	2	Understanding
M3.04	Describe the principle working of Heart lung machine	3	Understanding

Contents:

Ventilators - terminologies - cycling mechanisms - modes of Operation - working of a typical ventilator (block diagram).

Anaesthesia machine - principle - block diagram and working

Heart lung machine - Principle and need of cardiopulmonary bypass - Operation and types of oxygenators (bubble, film and membrane type) - block diagram

CO4	**Describe the working of drug delivery systems, endoscopy systems and radiotherapy unit.**		
M4.01	Explain the working of various types of drug infusion systems and their applications	5	Understanding
M4.02	State the principle of endoscopy.	2	Understanding
M4.03	Describe the parts of an endoscope	2	Understanding
M4.04	Explain the principle and working of Co-60 radiotherapy unit and LINACC system	6	Understanding
	Series Test - II	1	

Contents:

Principle of various types of drug infusion systems - Working and applications of syringe infusion pump - peristaltic infusion pump (block diagram)

Endoscopy- principle and working with diagram- Parts of an endoscope with schematic- Types of endoscopy with applications.

Radiotherapy - Isodose chart and biological effects of radiotherapy- Principle and operation of Co-60 radiotherapy unit, LINACC- principle and operation (with diagram), Applications of radiotherapy

Text / Reference:

T/R	Book Title/Author
T1	R S Khandpur - *Handbook of Biomedical instrumentation*- third edition, Tata McGraw Hill-India-2014
R1	John G. Webster - *Encyclopedia of Medical Devices and Instrumentation(*6 Volume set) , Wiley,7 April 2006
R2	Joseph J Carr and John M Brown - *Introduction to Biomedical Equipment Technology*- Fourth edition, Pearson Education India, 2008
R3	Mandeep Singh -*Introduction to Biomedical Instrumentation*, Second Edition, PHI Learning Pvt. Ltd., 01-Aug-2014
R4	R S Khandpur- *Handbook of Biomedical instrumentation*- third edition, Tata McGraw Hill-India-2014

Online Resources:

Sl.No	Website Link
1	https://www.youtube.com/watch?v=gk_Qf-JAL84
2	http://nptel.iitm.ac.in/
3	http://www.nptel.ac.in/
4	http://www.textbooksonline/