# GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN BIO-MEDICAL ENGINEERING

SEMESTER: V

Subject Name: **Critical Care Instrumentation**

| Sr. No. | Course content |
|---|---|
| 1. | **Introduction to Critical Care:**<br>1.1 Concepts of ICU, ICCU, NICU<br>1.2 General Design and layout<br>1.3 Draw the Gas piping layout. |
| 2. | **Patient Monitoring Systems & Telemetry:**<br>2.1 Need of bed side & central monitoring system<br>2.2 Multi-parameter monitor<br>2.3 Technical specifications , block diagram & principle of operation of patient monitor and central monitoring system<br>2.4 Principle of telemetry & types<br>2.5 Technical specifications, block diagram & principle of operation of single & multi channel telemetry systems |
| 3. | **Defibrillator:**<br>3.1 Fibrillation of heart, need of defibrillator, application techniques, instant & sync modes, types of electrodes<br>3.2 Technical specifications & principle of DC -Defibrillator<br>3.3 Simplified circuit diagrams of charging & discharging sections of DCDefibrillator |
| 4. | **Pacemaker:**<br>4.1 Cardiac arrhythmias - Heart block and need of cardiac pacemaker<br>4.2 Types of pacemaker with its characteristics – Internal & external; fixed, demand driven and programmable<br>4.3 Endocardial & myocardial leads<br>4.4 Technical specifications, block diagrams, circuit diagrams of fixed internal pacemaker<br>4.5 Technical specifications, block diagram and principle of external pacemaker with fixed and demand modes |
| 5. | **Ventilator, Nebulizer and Suction Apparatus:**<br>5.1 Anatomy & physiology of respiration & Apnea, need and application techniques of respirator / ventilator, nebulizer, suction apparatus and anesthesia apparatus<br>5.2 Technical specifications constructional block diagram and principle of operation of ventilators/ respirator, nebulizer, suction apparatus and boils apparatus. |
| 6. | **LIFE SUPPORT EQUIPMENT**<br>6.1 Need of heart - lung machine, oxygenator, artificial heart pump and heat exchanger Inta-aurotic balloon pump<br>6.2 Working Principle, block diagram,application of heart - lung machine, oxygenator, artificial heart pump and heat exchanger Inta-aurotic balloon pump |

## Laboratory Experiences:

1. Study construction of pacemaker leads
2. Testing & measurement on external pacemaker with dummy patient
3. Study of construction of defibrillator assembly
4. Study of construction of defibrillator assembly
5. Testing of charging, discharging & energy control in dc defibrillators with instant & sync mode
6. Monitoring of ECG on patient and study of its controls
7. Temperature control characteristic of baby incubator
8. Installation and testing of single channel telemetry
9. To perform and testing of blood leak detector
10. Study of construction of bubble oxygenator

## Demonstration (Any Three):

1. Demonstration of suction apparatus
2. Demonstration of nebulizer
3. Demonstration of central monitor
4. Demonstration of boils apparatus / anesthesia system
5. Demonstration of hemodialysis system
6. Demonstration of ventilator

## References Books:


1. Medical instrumentation application & design, John G. Webster, Eiditor.
2. Introduction to biomedical equipment technology, Carr Joseph J., Brown J.M.
3. Handbook of biomedical instrumentation, R. S. Khandpur.
4. Biomedical instrumentation & measurements, Lesli P Cromwell, Fred Jeibell, Erich A. Pfeiffer.
5. Medical Electronics, A.G. Patil.