GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN BIO-MEDICAL ENGINEERING

SEMESTER: V

Subject Name: **Installation, Maintenance and Servicing**

Sr. No.	Course Content
1.	**Introduction & Fundamental of Trouble Shooting:** 1.1 Definition of Installation, maintenance & servicing 1.2 Reliability aspects, equipment failure & cause of failure 1.3 Reliability prediction, maintenance policy 1.4 Tools & aids for troubleshooting 1.5 Trouble shooting techniques, procedure, grounding system and trouble-shooting check 1.6 Corrective & preventive maintenance
2.	**Installation Procedure:** 2.1 Equipment- X-ray machine, Auto analyzer, Electro surgery unit and Incubator OT& ICCU**:** over view, location, space requirement, design, isolation, light system, equipment sterilization.
3.	**Performance, Test & Calibration of Medical Equipment:** 3.1 Definition of calibration, calibration procedure, importance. 3.2 Analytical equipment: pH meter, calorimeter, spectrophotometer and flame photometer. 3.3 Diagnostic equipment: pulse oxymeter, audiometer and ECG. 3.4 Intensive care equipment: external pacemaker, defibrillator, and bedside monitor. 3.5 Therapeutic equipment: ultrasound therapy, short wave diathermy, electro surgery. 3.6 Imaging: X-ray.
4.	**Trouble Shooting & Fault Finding Procedure of Medical Equipment:** 4.1 Trouble shooting & fault finding procedure. 4.2 Preparation of fault finding tree / chart for following equipment. 4.2.1 Analytical equipment: - pH meter, spectrophotometer, Flame photometer, auto analyzer centrifuge, oven. 4.2.2 Diagnostic equipment: - pulse oxymeter, audiometer ECG, EEG, nerves & muscle stimulator. 4.2.3 Intensive care equipment: - pacemaker, defibrillator, suction apparatus, bedside monitor, baby incubator, boils apparatus. 4.2.4 Therapeutic equipment: -UV lamp, ultrasound therapy, short wave diathermy, nerves & muscle stimulator, electrocautery, CPM. 4.2.5 Imaging equipment - X-ray
5.	**Safety Instrumentation:** 5.1 Introduction. 5.2 Causes of electrical shock micro & macro shock. 5.3 Physiological effects of electrical shock. 5.4 Electrical hazards in hospital environment & leakage current. 5.5 Methods of accident prevention. 5.6 Test of grounding system in patient care area, chassis leakage current

Laboratory Experiences:

1. To Test the optimum performance & locate the fault of pH meter.
2. To Test the optimum performance & locate the fault of Colorimeter.
3. To Test the optimum performance & locate the fault of Spectrophotometer.
4. To Test the optimum performance & locate the fault of Flame photometer.
5. To Test the optimum performance & locate the fault of Pulse oxymeter.
6. To Test the optimum performance & locate the fault of Bedside monitor.
7. To Test the optimum performance & locate the fault of DC Defibrillator.
8. To Test the optimum performance & locate the fault of External pacemaker.
9. To Test the optimum performance & locate the fault of Ultrasound therapy.
10. To Test the optimum performance & locate the fault of Short wave diathermy.
11. To Test the optimum performance & locate the fault of Electro-surgery.
12. To Test the optimum performance & locate the fault of X-ray machine.
13. To Test the optimum performance & locate the fault of ECG machine.
14. To Test the optimum performance & locate the fault of Spiro meter.

Reference Books:

1. Biomedical instrumentation & measurements by Lesli P Cromwell, Fred J. Weibell, Erich A. Pfeiffer PUB: Prentice hall of India.
2. Introduction to biomedical equipment technology by Carr Joseph J., Brown, J.M PUB: Pearson Education (Asia).
3. Medical instrumentation application & design by John G. Webster, Editor, PUB: John Wiley and Sons.
4. Handbook of Biomedical Instrumentation by R. S. Khandpur PUB: Tata McGraw Hill.
5. Medical Electronics by A. G. Patil, PUB: Excel Books.
6. Principles of Biomedical Instrumentation and Measurements by Richard and Aston, by MERRIL an Imprint of Macmillan Publishers Co New York.
7. Modern Electronic Equipment Trouble shooting, Repair and Maintenanceby RS Khandpur, PUB: Tata McGraw Hill Publishing House, New Delhi.