

Nirma University
School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)

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Course Code	2ICDE56
Course Title	Biomedical Instrumentation

Course Learning Outcome:

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

- illustrate and analyze different diagnostic and therapeutic methods.
- analyze different medical imaging systems for different pathological diagnoses.
- utilize biomedical instruments for diagnostic purpose.

Syllabus

**Teaching
Hours**

UNIT 1: Introduction to biomedical instrumentation

02

Role of technology in medicine, basic medical instrumentation system.

UNIT 2: Fundamental of biomedical instrumentation

02

Sources of biomedical signals, General constraints in designing of medical instrumentation systems.

UNIT 3: Biopotential electrodes

03

Theory of electrode, Body surface recording electrodes, Internal electrodes, Microelectrodes, pH electrodes, pO₂ electrodes, pCO₂ electrodes.

UNIT 4: Biomedical recorders

05

Basics of cardiovascular system, Electrocardiograph machine, Phonocardiograph, Electroencephalograph machine, Electromyograph machine.

UNIT 5: Pacemakers and Defibrillators

02

Need of cardiac Pacemaker, External pacemaker, Implantable pacemakers, Need for defibrillator, DC defibrillator

UNIT 6: Pulmonary Function Analyzer

02

Basics of respiratory system, Pulmonary function measurement, Spirometer and respiratory gas analyzers.

UNIT 7: Haemodialysis Machine **02**
Function of kidneys, Artificial kidneys, Dialyzers, Haemodialysis machine.

UNIT 8: Medical Imaging Systems **04**

Information content of an image, Radiography (X-rays), Computed tomography, MRI, Ultrasonography.

UNIT 9: Patient monitoring system **06**

Measurement of heart rate, Blood pressure measurement, Blood flow meter, Blood gas analyzer, Wearable medical devices, Overview of Physiotherapy instruments.

02

UNIT 10: Patient Safety

Physiological effects of electricity, Macro shock hazards, Micro shock hazards, Basic approaches to protection against shock.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will consist of minimum 10 experiments based on the above syllabus.

References:

1. R.S. Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill.
2. Carr & Brown, Introduction to biomedical equipment technology, Prentice – Hall.
3. Leslie Cromwell, Biomedical Instrumentation and Measurements, Prentice – Hall.
4. John G. Webster, Medical Instrumentation: Application and Design, John Wiley & Sons.