

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	Instructions Hours per Week			Credits			
ETR6E4 INDUSTRIAL AND MEDICAL ELECTRONICS	L	T	P	L	T	P	Total
	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objective: To understand the application of Electronics in Medical Science & Industrial applications.

Prerequisite: Electrical Engg, Basic Electronics, Applied Chemistry and Physics

COURSE CONTENTS

Unit-I

Basic concept of Sensors and transducer, Transducers used for measurement of Displacement-resistive, inductive and capacitive method, Linear and Angular Velocity, Acceleration- seismic and piezoelectric accelerometer, Capacitive Transducer, Piezo-Electric Transducer, and LVDT, strain measurement technique, resistance strain gauge and its types, Signal conditioning of strain gauges.

Unit-II

Transducers for Temperature Measurement- Resistance Thermometer like RTD, Thermistor and Thermocouple, Radiation and Optical Pyrometer.

Transducers for Measurement of Pressure: - Manometers types, Elastic Types transducers, Low Pressure measurement gauges.

Unit-III

Transducers for Measurement of Flow: - Types of flow meters, variable head constant area meter and its types, constant head variable area meter and its types, variable head variable area meter and its types,

Transducer for Level Measurement: - Resistive method, Ultrasonic, Capacitive and Gamma Ray level Gauges.

UNIT-IV

Sources of biomedical signals, Medical instrumentation system, General constraints in design of medical instrumentation system, Origin & types of bioelectric signals, Electrodes used for ECG, EEG, EMG, Biomedical recorders: ECG, EEG, EMG, PCG, VCG, Lasers used in medical field, Bedside patient monitoring system, Biomedical telemetry & Telemedicine.

UNIT-V

X-ray machine & Digital radiography, Principles & system components of Computed-Tomography, Magnetic Resonance Imaging: Principles of NMR, Ultrasonic & Thermal imaging systems, Cardiac pacemaker, Artificial kidney, Dialyzers, Haemodialysis machine, Lithotripter system, Introduction to Defibrillators, Mechanics of Respiration, Artificial ventilation, Types of ventilators.

Learning Outcome:

Upon Completing the Course, Student will able to:

- Understand the various sources of bioelectric signals & their processing.
- Describe the fundamentals of various recording & diagnostic instruments.
- Study & understand the fundamentals of medical & laboratory instrumentation.
- Understanding of various Industrial transducers.

BOOKS RECOMMENDED:

- [1] A.K.Sawhney & Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, 12/e, Dhanpat Rai & Co. (P) Ltd., 2004
- [2] B.C.Nakra & K.K.Chaudhary, Instrumentation Measurement and Analysis, 2/e, TATA McGraw-Hill Publishing Company Ltd, New Delhi., 2003
- [3] D.Patranabis, Principles of Industrial Instrumentation, 2/e, Tata McGraw-Hill Publishing Company Ltd, New Delhi., 1998
- [4] R.S.Khandpur, Handbook of Biomedical Instrumentation, 2/e, Tata McGraw-Hill, 2007
- [5] John G. Webster, Medical Instrumentation, 4/e, Wiley, 2015

List of Practical Assignments:

1. Study of ECG Simulator for understanding the ECG signal & its generation process.
2. Using ECG Amplifier & CRO measure the amplitude, frequency & nature of ECG signal.
3. Study of EEG Simulator for understanding the EEG signal & its generation process.
4. Using EEG Amplifier & CRO measure the amplitude, frequency & nature of EEG signal.
5. Study of EMG Simulator for understanding the EMG signal & its generation process.
6. Using EMG Amplifier & CRO measure the amplitude, frequency & nature of EMG signal.
7. Study of Heart & Pacemaker.
8. Study of Defibrillator system.
9. Study of Respiratory system.
10. Experimental study of ph meter & UV-Spectrophotometer.
11. Study of various Temperature sensors.

12. Study of various Pressure sensors
13. Study of various Flow sensors
14. Study of various level sensors
15. Study of various displacement sensors