

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Biomedical Engineering

Semester: 3

Subject Code

Subject Name BIOMEDICAL TRANSDUCER

Sr. No.	Course content
1.	INTRODUCTION 1.1 Transducers and Signal acquisition 1.2 Introduction to man – instrument system 1.3 Problems encountered in measuring a living system 1.4 Classification of transducers. 1.5 The transducer and transduction principles
2.	TRANSDUCTION PRINCIPLES 2.1. Resistive, Inductive and Capacitive Transduction 2.2. Photoconductive and Photovoltaic Transduction 2.3. Fiber-Optic Sensor. 2.4. Strain Gauge-types, construction, Gauge factor, Bridge circuit, Temperature compensation. 2.5. LVDT- construction, sensitivity, merits etc. 2.6. Capacitive Transducer- variable separation, variable area and variable dielectric type, merits and demerits. 2.7. Piezoelectric Transducer: construction and working principle.
3.	TEMPERATURE TRANSDUCERS 3.1. Thermo resistive transducer- RTD and Thermistor. 3.2. Thermo emf Transducer- thermo couples; 3.3. Thermistor used for cardiac output measurement, nasal air flow measurement.
4.	PRESSURE TRANSDUCERS 4.1 Extra vascular and Intra vascular pressure sensors 4.2 Strain Gauge type Blood pressure transducers 4.3 Diaphragm type capacitive pressure transducer 4.4 Piezoelectric pressure transducer 4.5 Intra vascular fibre optic pressure transducer 4.6 Stethoscopes 4.7 Phonocardiograph sensor.
5.	FLOW TRANSDUCERS 5.1 Electromagnetic Blood flow transducer 5.2 Elasto resistive plethysmographic transducer 5.3 Air flow transducer for Fleish pneumotachometer 5.4 Ultrasonic flow transducer

6.	BIOPOTENTIAL MEASUREMENT
6.1	Origin of bioelectric signals
6.2	Different types of useful Bio-potentials
6.3	Electrode-Electrolyte interface, half cell potential, Polarization-polarizable and non-polarizable electrodes, Ag/AgCl electrodes, Electrode circuit model; Electrode and Skin interface and motion artifact .Body
6.4	Surface recording electrodes for ECG, EMG, EEG and EOG
6.5	Electrodes standards
6.6	Internal Electrodes- needle and wire electrodes
6.7	Micro electrodes- metal microelectrodes
6.8	Micropipet electrodes
6.9	Electrical properties of micro electrodes
6.10	Electrodes for electric stimulation of tissue
6.11	Methods of use of electrodes

LABORATORY EXPERIENCES :

Sr. No	Name of Experiments
1	To plot the characteristics of Potentiometer – (liner & angular)
2	To plot the characteristics of LVDT
3	To plot the characteristics of Strain gauge
4	To Demonstrate the Ultrasonic sensor
5	To plot the characteristics of Thermistor & RTD (PT100)
6	To plot the characteristics of Thermocouple
7	To Demonstrate the pH electrode
8	To plot the characteristics of Phototransistor / Photodiode
9	To plot the characteristics of LDR
10	To Measure the gain and frequency response of an instrumentation / differential amplifier
11	To plot the characteristics of Resistive Transducer
12	To plot the characteristics of Inductive Transducer
13	To plot the characteristics of Capacitive Transducer
14	To plot the characteristics of Strain Gauge
15	To Demonstrate the working of Piezoelectric Transducer

16	To Demonstrate the working of Stethoscopes
17	To Demonstrate the working of Phonocardiograph sensor.
18	To Demonstrate the working of Surface recording electrodes for ECG, EMG, EEG and EOG
19	To Demonstrate the working of Internal Electrodes-needle and wire electrodes ,Micro electrodes- metal microelectrodes
20	To Demonstrate the working of Electrodes for electric stimulation of tissue

Reference Books:

1. Biomedical Sensors- Fundamentals and applications. By- Harry.N. Norton.
2. Transducers for Biomedical measurements. (Principles and Applications.) By- Richard S.C. Cobbold.
3. Medical Instrumentation application and design. By- John G. Webster.
4. Principles of Applied Biomedical Instrumentation. By- Geddes,L.A and Baker,L.E
5. Bio-Sensors. By-Hall, E.A.H.
6. Biomedical Transducers and Instruments (CRC Press) By- Tatsuo Togawa., Toshiyo Tamura, P. Ake Oberg.