

Program : Diploma in Biomedical Engineering	
Course Code : 4249	Course Title: Medical Electronics Lab 1
Semester : 4	Credits: 4
Course Category: Program Core	
Periods per week: 4 (L:3, T:1, P:0)	Periods per semester: 60

Course Objectives:

- To provide hands-on experience for the students with the various kinds of transducers used in the medical field.
- To get acquainted with different IC's used in the medical electronics.

Course Prerequisites:

Topic	Course code	Course name	Semester
Skill of circuit assembling on breadboard		Electronic circuits lab	3
Knowledge of working of electronic circuits		Electronic circuits	3

Course Outcomes:

On completion of the course, the student will be able to:

CO _n	Description	Duration (Hours)	Cognitive Level
CO1	Interpret the characteristics of displacement measurement transducers and photo transducers by conducting the experiment.	12	Applying
CO2	Interpret the characteristics of temperature and pressure transducers by conducting the experiment.	9	Applying
CO3	Make use of Transducer IC's such as AD 590, LM35 and electrodes for biopotential measurements	8	Applying
CO4	Implement various circuits like skin contact impedance measurement, Flash ADC, Optical isolation circuit.	13	Applying
	Lab Exam	3	

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2					
CO2	3	2					
CO3	3	2					
CO4	3		3	3		2	2

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	Interpret the characteristics of displacement measurement transducers and photo transducers by conducting the experiment.		
M1.01	Set up the circuit and measure displacement using potentiometer	3	Applying
M1.02	Set up the circuit and measure the level/ displacement using capacitive transducer	3	Applying
M1.03	Plot output characteristics of LVDT and measure displacement using LVDT	3	Applying
M1.04	Set up the circuit and plot LDR characteristic curve	1.5	Applying
M1.05	Set up the circuit and measure the characteristics of photodiode	1.5	Applying
CO2	Interpret the characteristics of temperature and pressure transducers by conducting the experiment.		
M2.01	Implement the circuit to plot the characteristics of the thermistor.	3	Applying
M2.02	Implement the circuit to plot characteristics of RTD	3	Applying
M2.03	Implement the measurement of strain using strain gauge.	3	Applying
	Lab Exam – I	1½	
CO3	Make use of Transducer IC's such as AD 590, LM35 and electrodes for biopotential measurements		
M3.01	Familiarize AD 590 and plot its characteristics.	2	Applying
M3.02	Familiarize LM35 and plot its characteristics	3	Applying

M3.03	Familiarize with various types of ECG, EEG and EMG electrodes.	3	Applying
CO4	Implement various circuits like skin contact impedance measurement, Flash ADC, Optical isolation circuit.		
M4.01	Set up the circuit and measure skin contact impedance using suitable circuit.	3	Applying
M4.02	Set up the circuit to work as Flash ADC (3 bit).	3	Applying
M4.03	Set up the circuit using opto-coupler (IC MCT2E) as an isolation circuit.	3	Applying
M4. 04	Open ended Experiments**	4	Applying
	Lab Exam – II	1½	

**** - Suggested Open Ended Projects**

(Not for End Semester Examination but compulsory to be included in Continuous Internal Evaluation. Students can do open ended experiments as a group of 4-5. There is no duplication in experiments between groups. Open ended experiments should include the use of transducers, ICs studied and other application circuits. Circuits can be simulated using suitable software.)

- 1) Design and simulate circuits to identify
 - Obstacles in the surrounding
 - Temperature in an observation area
 - Pressure variations
 - Intensity of light
- 2) Implement application circuits in simulation software/breadboard/PCB.
 - 16-bit ADC with commercially available ICs
 - Temperature regulators for incubators/sterilizers
 - Light Intensity controllers for phototherapy unit
 - Respiration rate monitor with displacement transducers

Text / Reference:

T/R	Book Title/Author
T1	<u>A.K. Sawhney</u> <i>A Course in Electronic Measurements and Instrumentation</i> Dhanpat Rai & Co. (P) Limited 2015
R1	R S Khandpur- <i>Handbook of Biomedical instrumentation</i> - McGraw Hill Education; Third edition (4 August 2014)
R2	Ramakant A Gayakwad- <i>Op - Amps and Linear Integrated Circuits</i> Prentice Hall India Learning Private Limited 2002

Online Resources:

Sl.No	Website Link
1	https://www.vidyarthiplus.com/vp/attachment.php?aid=2447
2	https://www.electronicscircuits.com/
3	https://www.tutorialspoint.com/