

Sardar Patel Institute of Technology Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
Code		L	Т	P	L	Т	Р	Total
	Biomedical Electronics			2			1	1
		Examination Scheme						
EXL8044		ISE		ESE			Total	
				Prac	ctical	Oral		
		4	0	-			20	60

Pre-requisite Co	urse Co	odes EXC8044 (Biomedical Electronics)			
After successful completion of the course, student will be able to					
	CO1	Evaluate design of building blocks for various medical instruments			
	CO2	Aeasure various bioelectric signals using advanced electronics techniques			
Course	CO3	Justify the necessity and principle of operation of health related medical			
Outcomes		instruments used in hospital			
	CO4	Justify the importance of patient safety			
	CO5	Check biomedical equipment related standards			

Exp. No.	Experiment Details	Ref.	Marks
1	Aim: Simulate the instrumentation amplifier with TINA SPICE and	1,2	05
	plot frequency response. Implement the instrumentation amplifier		
	with Texas Instruments ALSK or on bread board. Compare and		
	discuss the simulation and experimental results.		
	Objective: In this experiment student should understand the need of		
	instrumentation amplifier in biomedical instrumentation. Also		
	should able to design and implement IA with high value of gain		
	(>1000) and CMRR.		
	Tasks: i) Simulate IA for high value of gain and CMRR & obtain		
	frequency response.		
	ii) Implement IA using hardware components with same		
	values		
	& plot frequency response.		
	iii) Verify simulation and hardware results.		
2	Aim: To design, simulate and implement notch filter (50Hz). Plot	1,2	05
	the frequency response and compare experimental results with		
	simulation results.		
	Objective: In this experiment student should understand the need of		
	Notch filter in biomedical instrumentation. Also should able to		
	design and implement notch filter.		



Sardar Patel Institute of Technology Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous Institute Affiliated to University of Mumbai)

Tasks: i) Simulate notch filter & obtain frequency responseii) Implement notch filter using hardware components with same values & plot frequency response.iii) Verify simulation and hardware results.3Aim: To obtain, measure and analyze simulated and real time ECG waveforms using simulator board ST2351 and ST2352.305Objective: In this experiment student should understand the measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any.305Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG using ST2352 board for different lead configurations. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4054Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview.055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student				
same values & plot frequency response. iii) Verify simulation and hardware results. 3 Aim: To obtain, measure and analyze simulated and real time ECG waveforms using simulator board ST2351 and ST2352. 3 05 Objective: In this experiment student should understand the measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any. 4 Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and Lab View. 0 4 05 Øbjective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. 4 05 5 Aim: To record and analyze real time ECG graphs. 4 05 5 Aim: To record and analyze real time ECG graphs. 4 05 6 Os many is biomedical electronics toolbox of Labview. 0 0 0 9 With Labview.				
iii) Verify simulation and hardware results. iii) Aim: To obtain, measure and analyze simulated and real time ECG waveforms using simulator board ST2351 and ST2352. 3 05 Objective: In this experiment student should understand the measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG using ST2351 board. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any. 05 4 Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. 04 05 of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. and NI-Elvis. ii) Using Biomedical electronics toolbox of Labview and NI-Elvis. ii) Using Biomedical electronics toolbox of Labview. 4 05 5 Aim: To record and analyze real time ECG graphs. 4 05 05 sensor, Ni-Elvis and LabView. 01 02 05 05 of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labvie				
3 Aim: To obtain, measure and analyze simulated and real time ECG waveforms using simulator board ST2351 and ST2352. 3 05 Waveforms using simulator board ST2351 and ST2352. Objective: In this experiment student should understand the measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG using ST2352 board for different lead configurations. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any. 4 05 4 Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and Lab View. 4 05 Objective: In this experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. 4 05 S Aim: To record and analyze real time ECG graph using Labview and NI-Elvis. ii) Compare normal and abnormal ECG graphs. 4 05 5 Aim: To record and analyze real time ECG graphs. 4 05 6 Aim: To record and analyze real time ECG graphs. 4 05 7 Aim: To record and analyze real time ECG graphs.				
 waveforms using simulator board ST2351 and ST2352. Objective: In this experiment student should understand the measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG using ST2352 board for different lead configurations. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any. 4 Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview. and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. 5 Aim: To record and analyze real time ECG graphs. 5 Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis. ii) Compare normal and abnormal ECG graphs. 5 Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis. ii) Compare normal and abnormal ECG graphs. 5 Aim: To record and analyze real time EEG w		iii) Verify simulation and hardware results.		
Objective:In this experiment student should understand the measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record real time ECG using ST2351 board. ii) Record real time ECG using ST2352 board for different lead configurations. iii) Compare simulated & creal time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4054Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time ECG graph using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.405	3	Aim: To obtain, measure and analyze simulated and real time ECG	3	05
measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG using ST2351 board. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4054Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.4055Aim: To record and analyze real time ECG graph using Labview and NI-Elvis. ii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time ECG graph using Labview and NI-Elvis. ii) Compare normal and abnormal ECG graphs.4056Aim: To record and analyze real time ECG graph using Labview and NI-Elvis. iii) Compare normal and abnormal ECG graphs.4057Aim: To record and analyze real time ECG graphs.4058Aim: To record and analyze real time ECG graphs.4059Aim: To record and analyze r		waveforms using simulator board ST2351 and ST2352.		
measurement procedure for ECG using ST2351 and ST2352 boards. Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG using ST2351 board. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4054Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.4055Aim: To record and analyze real time ECG graph using Labview and NI-Elvis. ii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time ECG graph using Labview and NI-Elvis. ii) Compare normal and abnormal ECG graphs.4056Aim: To record and analyze real time ECG graph using Labview and NI-Elvis. iii) Compare normal and abnormal ECG graphs.4057Aim: To record and analyze real time ECG graphs.4058Aim: To record and analyze real time ECG graphs.4059Aim: To record and analyze r		Objective: In this experiment student should understand the		
Also student should understand various lead configurations and their importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any.Tasks: i) Record simulated ECG using ST2351 board. ii) Record real time ECG using ST2352 board for different lead configurations. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView.4Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.4055Aim: To record and analyze real time EEG graph using Labview and NI-Elvis. iii) Compare normal and abnormal ECG graphs.4056Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.405				
 importance and able to analyze the recorded ECG's. Depending on the nature of ECGgraph and measured values student should able to identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. ii) Record simulated ECG using ST2352 board for different lead configurations. iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any. 4 Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs. 5 Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the interfacing of hardware components electronics toolbox reactions abnormalities. iii) Compare normal and abnormal ECG graphs. 5 Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. 				
the nature of ECGgraph and measured values student should able to identify the abnormalities if any.Tasks: i) Record simulated ECG using ST2351 board.ii) Record real time ECG using ST2352 board for different lead configurations.iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView.405Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.4055Aim: To record and analyze real time ECG graphs.4055Aim: To record and analyze real time ECG graphs.4056win: To proced and analyze real time ECG graphs.4057win: To record and analyze real time ECG graphs.4058iii) Compare normal and abnormal ECG graphs.4059various abnormalities. iii) Compare normal and abnormal ECG graphs.4059Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.4059Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.4059Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.4059<		-		
identify the abnormalities if any. Tasks: i) Record simulated ECG using ST2351 board. 				
Tasks: i) Record simulated ECG using ST2351 board.ii) Record real time ECG using ST2352 board for different lead configurations.iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments.iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView.Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis.ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities.iii) Compare normal and abnormal ECG graphs.5Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.Objective: In this experiment student should understand the interfacing of hardware components electronics toolbox plot ECG graphs for various abnormalities.iii) Compare normal and abnormal ECG graphs.5Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.		•		
configurations.iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView.4054Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview. Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.405		•		
iii) Compare simulated & real time ECG and note down values of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.4Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview. Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis.45Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.		ii) Record real time ECG using ST2352 board for different lead		
of amplitude, time duration, etc; for P, QRS, T & U segments. iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.04Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview. Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis. iii) Compare normal and abnormal ECG graphs.4055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.05		configurations.		
iv) Note down the value of heart rate for real time ECG and identify abnormalities if any.Image: Constant of the experiment of the experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment student should understand the interfacing of hardware components toolbox plot ECG graphs for various abnormalities.Image: Constant of the experiment student should understand the iii) Compare normal and abnormal ECG graphs.Image: Constant of the experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Constant of the experiment st				
identify abnormalities if any.Image: constraint of the sensor				
 4 Aim: To record and analyze real time ECG waveform using ECG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs. 5 Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. 				
 sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs. Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. 			4	0.5
Objective: In this experiment student should understand the recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Comparison of the end	4	-	4	05
recording procedure for ECG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis.Iii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities.5Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.4055Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.405Cobjective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.4				
of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis.ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.5Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.4Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.				
interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis.ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.45Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.4Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.4				
PC with Labview.Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis.ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.5Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.405Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.405				
Tasks: i) Develop a VI to plot real time ECG graph using Labview and NI-Elvis. ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities. iii) Compare normal and abnormal ECG graphs.Image: Compare comparison of the compare normal student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.405				
and NI-Elvis.ii) Using Biomedical electronics toolbox plot ECG graphs for various abnormalities.iii) Compare normal and abnormal ECG graphs.5Aim: To record and analyze real time EEG waveform using EEG sensor, Ni-Elvis and LabView.Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.				
various abnormalities. iii) Compare normal and abnormal ECG graphs.Image: Compare normal and abnormal ECG graphs.5Aim: To record and analyze real time EEG waveform using EEG405sensor, Ni-Elvis and LabView.Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Compare normal and abnormal ECG graphs.				
various abnormalities. iii) Compare normal and abnormal ECG graphs.Image: Compare normal and abnormal ECG graphs.5Aim: To record and analyze real time EEG waveform using EEG405sensor, Ni-Elvis and LabView.Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.Image: Compare normal and abnormal ECG graphs.		ii) Using Biomedical electronics toolbox plot ECG graphs for		
 5 Aim: To record and analyze real time EEG waveform using EEG 4 05 sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview. 				
sensor, Ni-Elvis and LabView. Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.		iii) Compare normal and abnormal ECG graphs.		
Objective: In this experiment student should understand the recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview.	5	Aim: To record and analyze real time EEG waveform using EEG	4	05
recording procedure for EEG using biomedical electronics toolbox of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.		sensor, Ni-Elvis and LabView.		
of Labview and NI-Elvis kit. Also student should understand the interfacing of hardware components electrodes-protoboard-NI-Elvis-PC with Labview.		Objective: In this experiment student should understand the		
interfacing of hardware components electrodes-protoboard-NI-Elvis- PC with Labview.		recording procedure for EEG using biomedical electronics toolbox		
PC with Labview.		of Labview and NI-Elvis kit. Also student should understand the		
		interfacing of hardware components electrodes-protoboard-NI-Elvis-		
Tasks: i) Develop a VI to plot real time EEG graph using Labview		PC with Labview.		
		Tasks: i) Develop a VI to plot real time EEG graph using Labview		



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India (Autonomous Institute Affiliated to University of Mumbai)

	and NI-Elvis.		
	ii) Using Biomedical electronics toolbox plot EEG graphs for		
	various abnormalities.		
	iii) Compare normal and abnormal EEG graphs.		
6	Aim: To record and analyze real time EMG waveform using EMG	4	05
	sensor, Ni-Elvis and Labview.		
	Objective: In this experiment student should understand the		
	recording procedure for EMG using biomedical electronics toolbox		
	of Labview and NI-Elvis kit. Also student should understand the		
	interfacing of hardware components electrodes-protoboard-NI-Elvis-		
	PC with Labview.		
	Tasks: i) Develop a VI to plot real time EMG graph using Labview		
	and NI-Elvis.		
	ii) Using Biomedical electronics toolbox plot EMG graphs		
	for		
	various abnormalities.		
	iii) Compare normal and abnormal EMG graphs.		
7	Aim: Design, implement and demonstrate various circuits for		05
	implementation of biomedical data acquisition/ instrumentation		
	system (Innovative – Application/Project based learning)		
8	Aim: To demonstrate Medical instruments X-ray machine, CT	Based	05
	machine, MRI machine, Defibrillator, Pacemaker, Bedside monitor,	on	
	Dialysis machine, Anesthesia machine and electrosurgical unit	hospital	
	Objective: In this experiment students will understand the working	visit	
	principle of imaging instruments. Also students should able to		
	differentiate between X-ray machine, CT machine and MRI		
	machine.		
	Tasks: Draft a detailed report on imaging instruments mentioning		
	model number of the instruments, name of the company,		
	specifications, working principle, procedure, safety & precautions.	1 Montra	40
	1012	al Marks	40

References:

- 1. John G. Webster, "Medical Instrumentation", John Wiley and Sons, 4th edition, 2010.
- 2. R. S. Khandpur, "Biomedical Instrumentation", TMH, 2004.
- 3. ST2351 & ST2352 Manual

4. <u>www.ni.com</u>