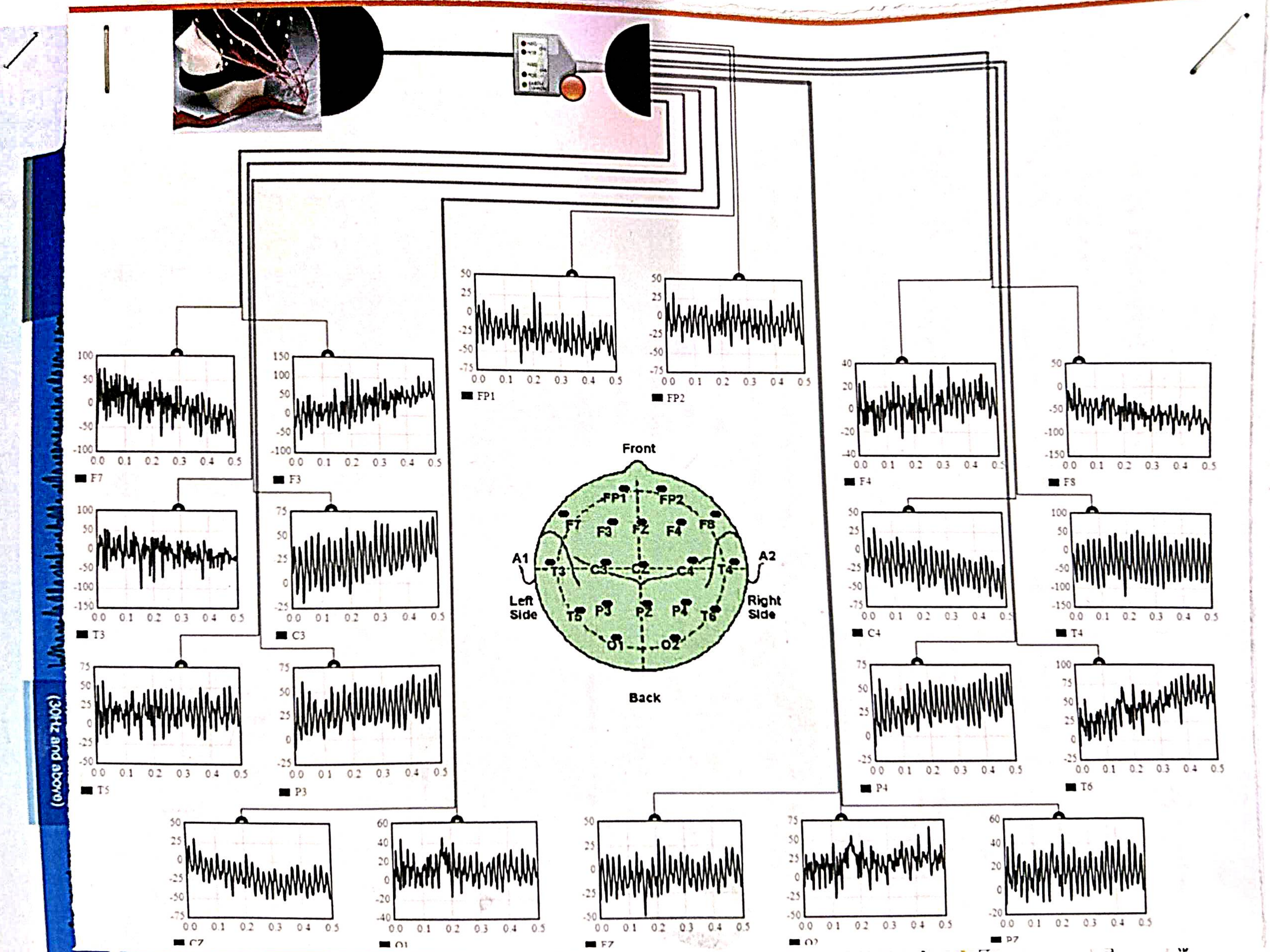

Front
Back
Left Side
Right Side
A1
A2
FP1
FP2
F7
F3
FZ
F4
F8
T3
C3
CZ
C4
T4
T5
P3
PZ
P4
T6
O1
O2

PRACTICAL NO: 1

Date : 09/01/2025

TITLE : To simulate Electroencephalogram Signal.

AIM / OBJECTIVE: To understand normal size EEG pattern and Various abnormalities associated with EEG.

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

Biomedical and Signal processing lab virtual lab.
Pc
Reference book.
Notes.

CONCEPT / THEORY OF EXPERIMENT:

The EEG is a unique and valuable measure of the brains electrical functions. It is a graphic display of a difference in Voltages from two sides of brain function recorded over time EEG involves the study of recording these electrical signal that are generated by the brain.

PROCEDURE :

1. Select the type of patient from the waveform Selector menu.
2. Set the desired sampling rate and the number of samples to be displayed on screen.
3. Run the simulation.
4. Observe the Various waveforms at different lead as shown in the fig.
5. Go to simulate tab for performing the simulation.

Parameter	F7	F3	FP1	FP2	F4	F8	T3	C3	C4	T4	T5	P3	P4	T6	CZ	O1	FZ	O2	PZ
Healthy Patient Baseline Activity	73.6	174	27.7	30.4	38	7.71	138	232	19.5	54.9	54.7	163	163	130	235	45.1	104	85	64
Left hand Backward	182.6	44.6	338	-667	194	-234	-4.2	59.4	-12.9	-286	22.5	123	123	73.9	19.6	142	187	79.5	137
Left hand Forward	167	148	172	-267	157	-393	-37.2	81.9	-16.6	-98.3	197	119	119	7.5	87.2	119	192	89.2	98.6
Left hand Imaginary Backward	151	446	264	-116	210	-221	-14.5	74.9	10.6	117	58.7	90.6	90.6	77	136	134	261	71.8	151
Left hand Imaginary Forward	167	148	172	-267	157	-393	-37.2	81.9	-16.9	-99.2	203	119	119	7.32	87.6	119	192	89.2	98.6
Left hand Random Movement	189	56.7	145	-143	88.5	192	224	110	-11.9	57.2	26.6	-50.5	-50.5	60.3	113	79.7	40.1	12.9	110
Left Leg	144	228	172	-120	200	-199	36.5	21.8	38	-165	41.2	110	110	103	-79.7	100	198	55.4	99.5
Right hand Backward	130	238	-26.9	-596	116	-249	-24.4	90.5	24.9	-59.7	-53.5	111	111	38.2	256	82.7	168	107	126
Right hand Forward	132	269	91.7	-317	61.6	-45.7	17.9	59.4	54.9	46.1	29.9	96.7	59.3	266	57.9	151	104	106	98.24
Right hand Imaginary Backward	207	199	144	-255	141	-405	26.7	75.6	-12.9	-138	63.3	121	121	42	-74	111	237	100	121
Right hand Imaginary Forward	132	212	12.6	-331	-31.9	-428	-22	65.6	4.3	-354	-401	89.5	89.5	59.5	78	99.1	187	83.9	100
Right hand Random Movement	158	148	172	-273	157	-393	-37.2	81.9	-16.6	-99.2	203	119	119	10.6	87.6	119	192	89.2	96.7
Right Leg	84.4	131	124	-50.6	208	-121	34.2	53.4	-3.13	-69.7	42.8	83.1	83.1	18.2	38.3	83.8	113	39	84.3

Table of electron Readings.

OBSERVATIONS

ACTION POTENTIAL.

The information transmitted by a nerve is called an action potential APs are called by an exchange of ions accross the neurons membrance and an AP is an tempoapy change the membrane potential that is transmitted along the axon. It is usually initiated in cell body and normally travels in one direction.

Steps in AP Generation in Human Brain.

1. Nerve cells dendrites recieve stimulate and Na ~~chances~~ channels opens.
2. Action thershold is reached, causing additional Na^+ channels to open and depolarization occurs driving the membrance potential upto approximately +30mv.
3. Na^+ channels close and K^+ channels open, leading to repolarization back towards the rest potential.
4. Repolarization overshoots to about 90mv coused by hyperpolarization which prevents new stimuli and ensures signal transmission in one direction.

CALCULATIONS :

BRAIN RYTHMS.

There are 5 major brain waves distinguished by their freq range.

Delta below 5Hz

Theta : 4Hz to 8Hz

Beta : Above 13Hz

Gamma : 30 to 40 Hz

Alpha : 8 to 13Hz

RESULTS :

- Observed the normal EEG pattern
- Understand other abnormalities for Various associated with EEG.
- Observed the EEG waveform for Various different body movements

CONCLUSION :

Simulated EEG signal and observed the different abnormalities associated with EEG.

PRACTICAL NO: 2

Date : 16/01/2025

TITLE : To Simulate Eelectrocardiogram waveform.

AIM / OBJECTIVE: To understand normal ECG waveform of also various abnormalities associated with ECG.

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

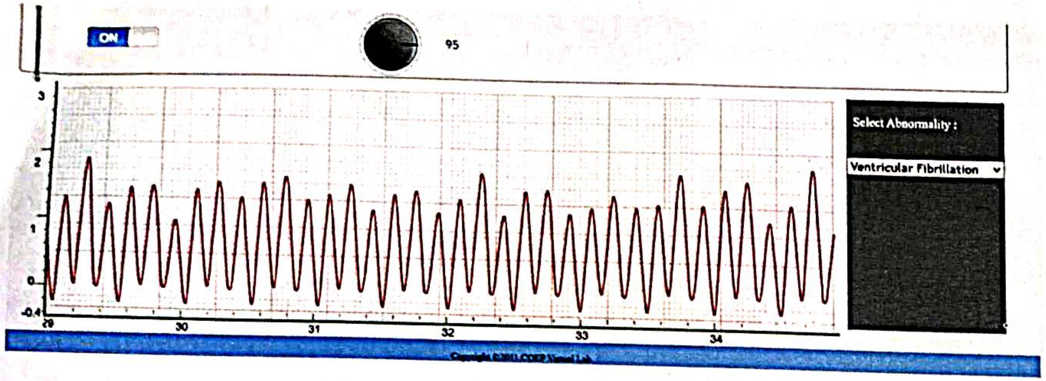
Biomedical and signal processing lab- Virtual lab.
Pc
Reference book.

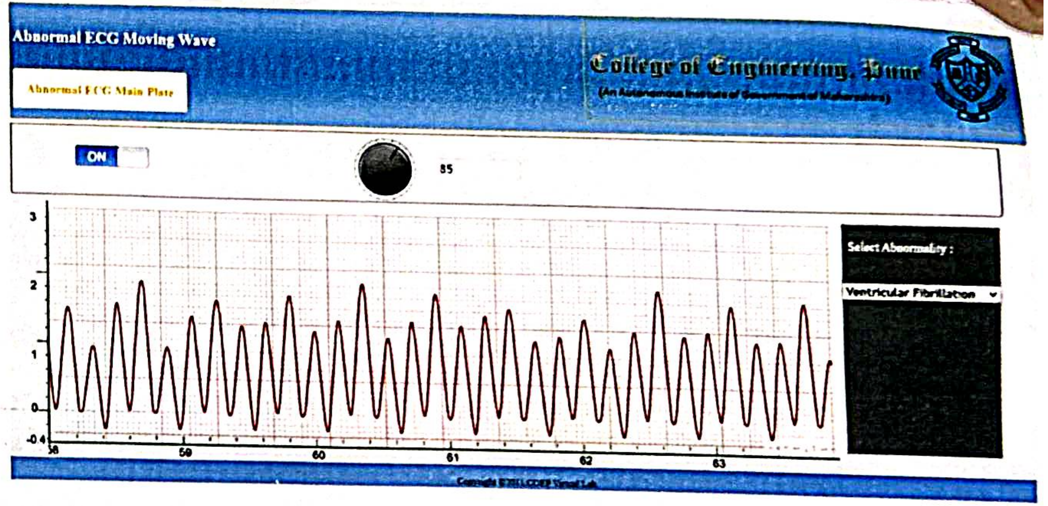
CONCEPT / THEORY OF EXPERIMENT:

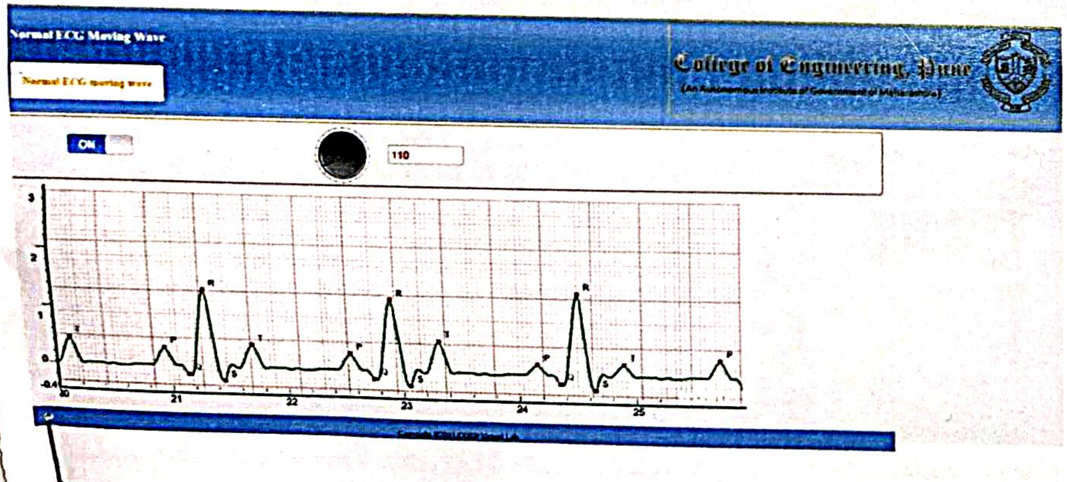
Electrocardiogram signal is a graphical representation of the electrical activity occuring in the heart over time. The heart's electrical activity is generated by specilaized cells within the heart's conduction system. This electrical activity coordinates the heart muscles contraction and relaxation.

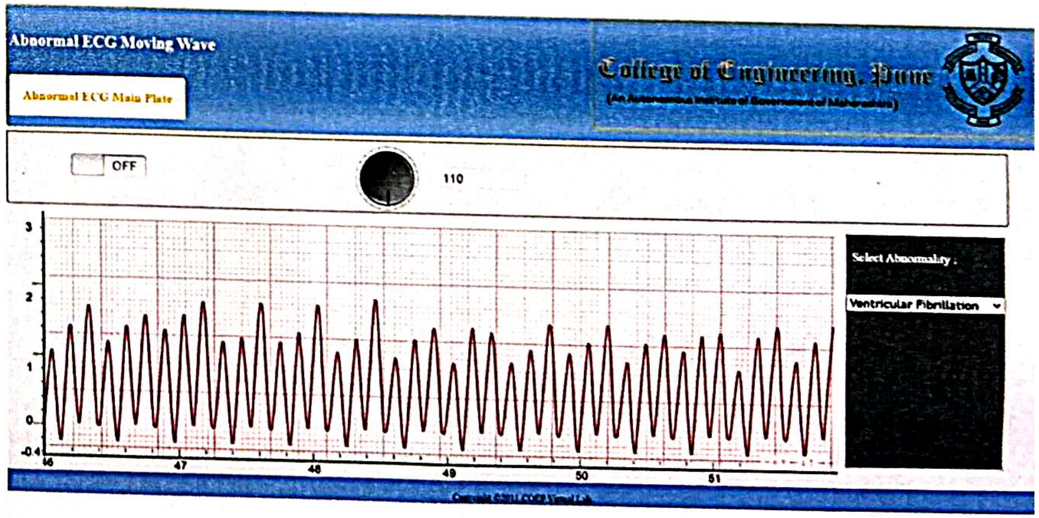
PROCEDURE :

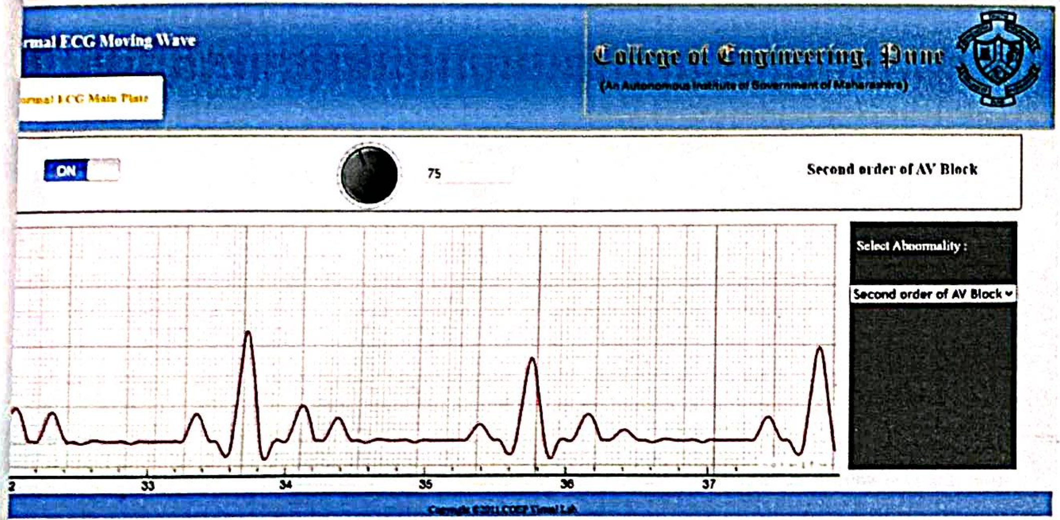
1. Open the simulation page on Virtual lab.
2. Select the appropriate ECG Waveform.
3. Use the ON OFF toggle to stop the waveform and label the different.
4. Simulate the ECG waveform for different heart rate and save the output for each.
5. Compare and analyze the results for normal and abnormal waveform.


ON
95
Select Abnormality :
Ventricular Fibrillation

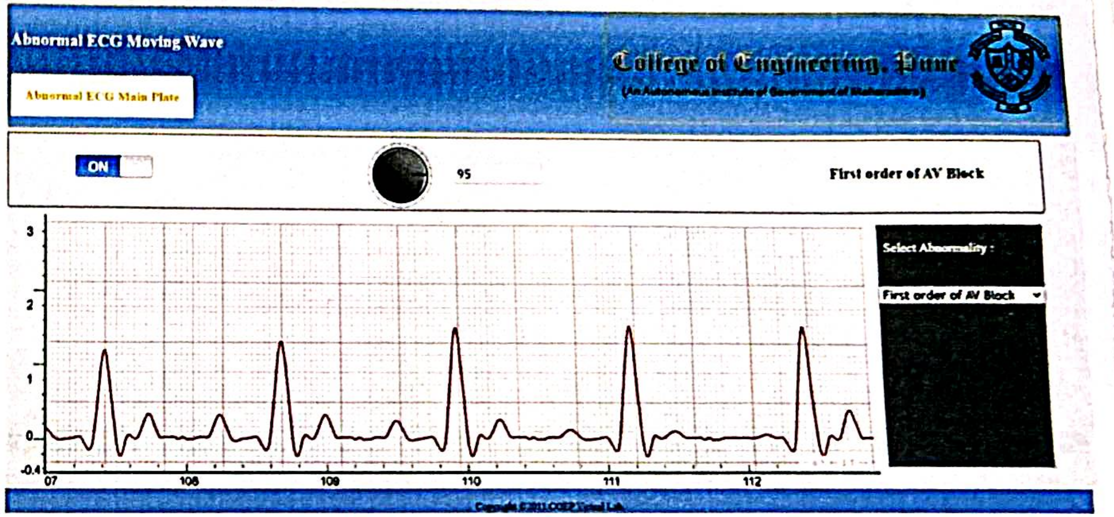

Abnormal ECG Moving Wave
Abnormal ECG Main Plate
College of Engineering, Pune
ON
85
Select Abnormality :
Ventricular Fibrillation


Normal ECG Moving Wave
Normal ECG moving wave
College of Engineering, Pune
ON
110

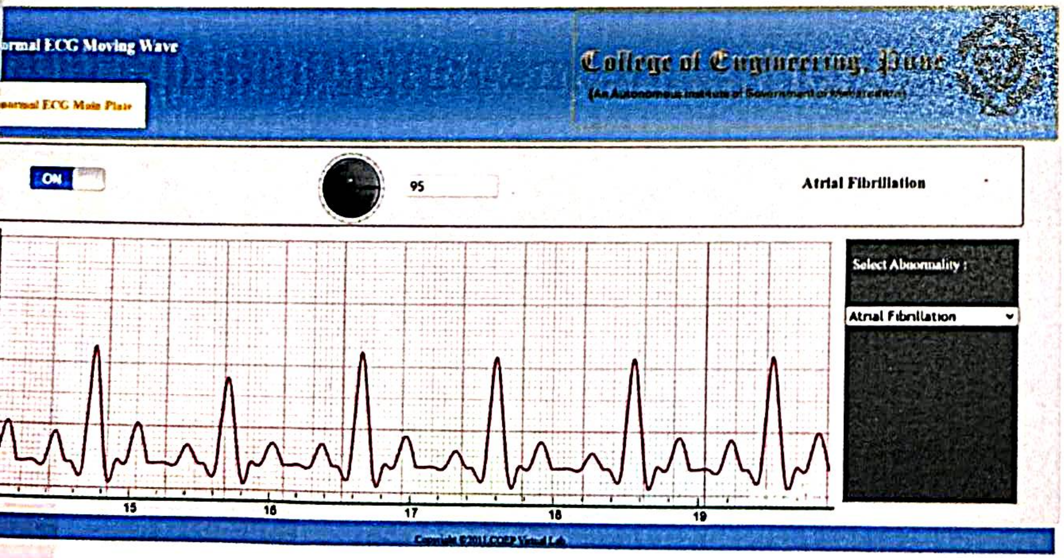

Abnormal ECG Moving Wave
Abnormal ECG Main Plate
College of Engineering, Pune
OFF
110
Select Abnormality :
Ventricular Fibrillation



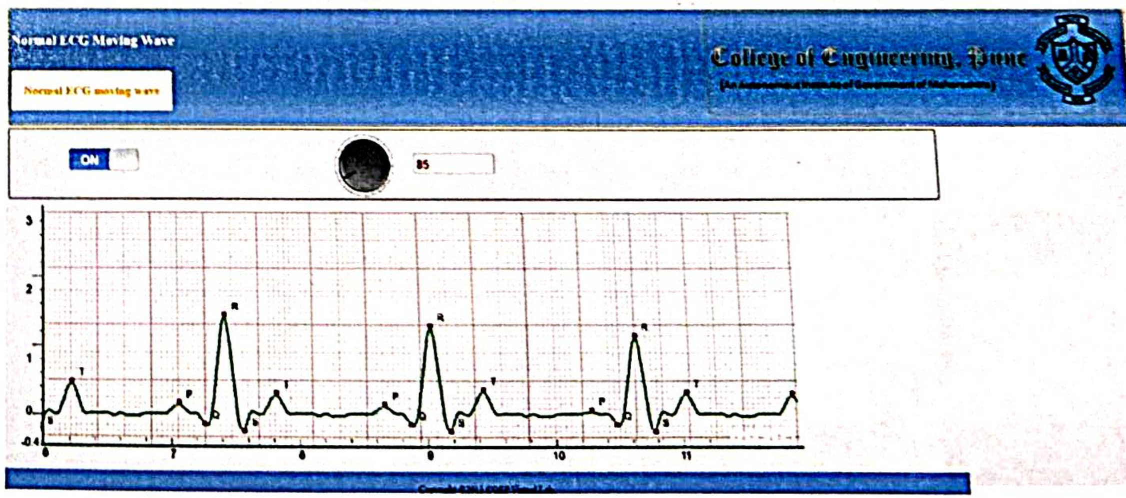
rmal ECG Moving Wave
College of Engineering, Pune
(An Autonomous Institute of Government of Maharashtra)
ON
75
Second order of AV Block
Select Abnormality :
Second order of AV Block
33
34
35
36
37



Abnormal ECG Moving Wave
Abnormal ECG Main Plate
College of Engineering, Pune
ON
95
First order of AV Block
Select Abnormality :
First order of AV Block
108
109
110
111
112



rmal ECG Moving Wave
College of Engineering, Pune
ON
95
Atrial Fibrillation
Select Abnormality :
Atrial Fibrillation
15
16
17
18
19



Normal ECG Moving Wave
College of Engineering, Pune
ON
85
R
P
T
7
8
9
10
11

OBSERVATIONS

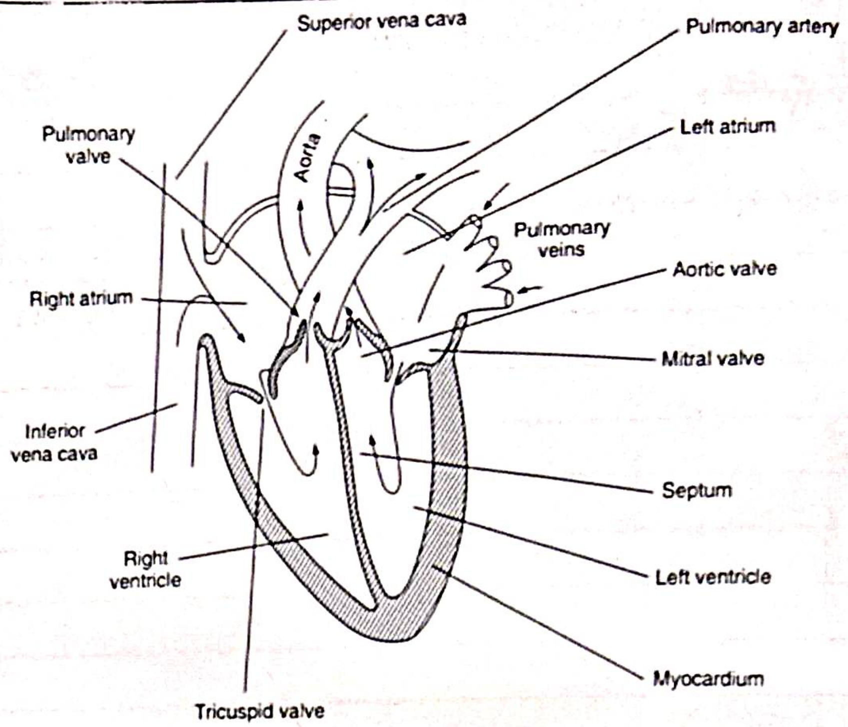
ECG Generation :
The human heart's electrical system comprises of 3 main parts. The sinoatrial (SA) node a trioventricular (AV) node and the His-Purkinje system. Each heartbeats involves diastole (relaxation) and systole (contraction) phases of the heart beat, acting as the natural pacemaker, signaling the atria to contract and fill the ventricles with blood. The signal then travels to the AV node, which briefly delays, it allowing the ventricles to fill completely. Subsequently, the signal spreads through the His-Purkinje system. causing coordinates ventricular contraction. This electrical activity can be measured by electrodes placed on the body surface, recording on ECG.

QRS complex
Description - Second major deflection seen on the ECG significance
Significance - Repreents ventricular depolarization.
Duration - Naturally 60 to 100 milliseconds.
Shape - Can vary in morphology depending on lead and orientation of the heart.

P wave.
Description : First deflection seen on ECG.
Significance - Represents ventricular depolarization.
Duration - 60 to 100 milliseconds.
Shape - Smooth and rounded.

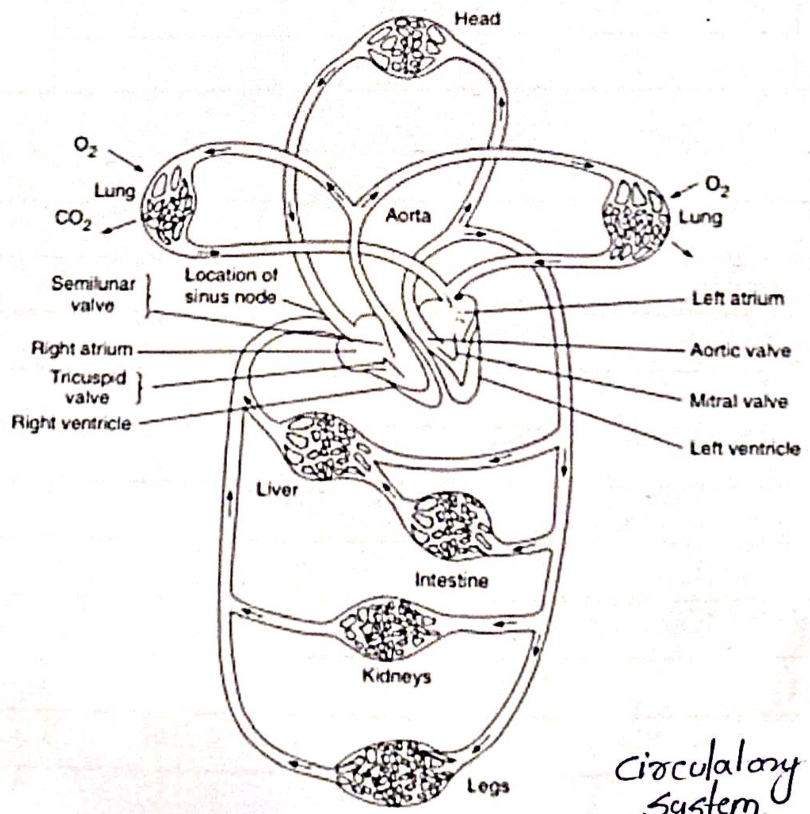
T wave.
Description - Follows the QRS complex.
Significance - Represents time taken for electrical impulse to travel from atria to ventricles.
Duration - About 120 to 200 milliseconds.

CALCULATIONS:



Stoucture of Heart

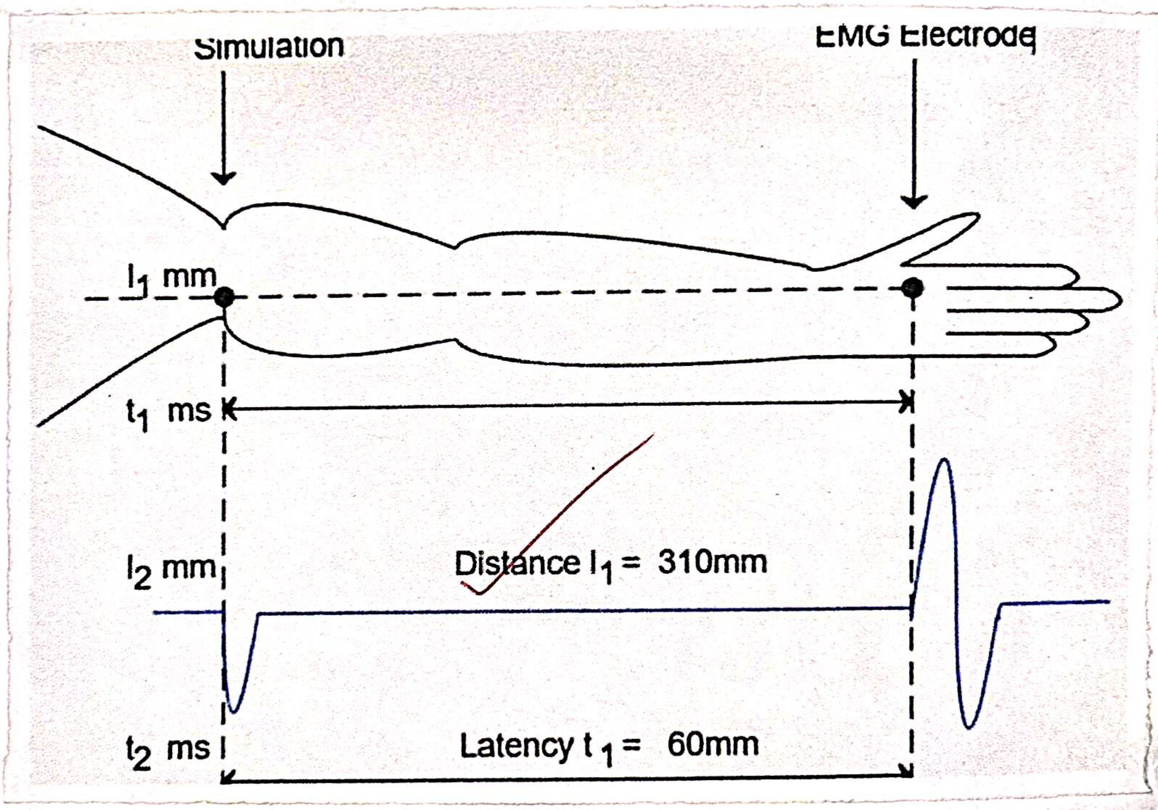
RESULTS :



Circulalory System.

CONCLUSION :

Observed Various abnormalities in ECG waveforms at different heart rates.



Electoomyogoram
Signal.

PRACTICAL NO: 3

Date : 30/01/2025

TITLE : To Simulate Electromyogram signal.

AIM / OBJECTIVE: To simulate EMG waveform and analyze the same.

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

Biomedical and Signal Processing Virtual Labs.
Internet.
Reference Book.
Pc.

CONCEPT / THEORY OF EXPERIMENT:

Electromyography is a technique for evaluating and regarding the electrical activity produced by skeletal muscle EMG is performed using an Instrument called an electromyography to produce a record called an electromyograph.

PROCEDURE :

1. Open the Simulation Tab on the virtual lab.
2. Generate Gaussion random signals by changing the frequency.
3. Observe the deviation gaussion function by various control.
4. Truncate the signal by changing the alpha.
5. Observe the power spectrum of EMG.

OBSERVATIONS

* Electromyography.

The evalution and records the electrical activity of the skeletal muscles using on EMG. This technique detects muscle cell electrial potential when activated. Two common types are intramuscular. EMG using needle electrodes inserted into muscle tissues, and surface EMG (SEMG), recording muscle activity from the skin surface SEMG is non inasive and widely used for diagnosing neuromuscular disorders, rehabiliation and device control application.

* EMG Measurement.

The human muscular system is composed of muscular libre organised into motor units, each controlled units, each controlled by the single motor neuron. Muscle contraction, essitial for movement, involves types :- Isometic (muscle length remains constant); Concentric (muscle remains shortens) and electrical (muscle lengthens) Motor units are recruited based on the size principle smaller units are recruited based on the size principle and larger units as needed for the increased force. Motor units action potentials (MUAPS) propagate along muscle fibres, generating electrical activity detected, as fibre arrangement, electrode proximity and tissue properties Surface EMG record microvolt level signals, Motor unit fire at varying rates, influencing muscle fibres type and function.

CALCULATIONS :

Reading 2

Formula for EMG.

Velocity $v_1 = \frac{l_1 - l_2}{t_1 - t_2}$

From Virtual labs

$l_1 = 112.99$

$l_2 = 82.99$

$t_1 = 0.36 m/s$

$t_2 = -1 m/s$

$\therefore v = \frac{112.99 - 82.99}{0.36 - (-1)}$

$v = \underline{21.92 m/s}$

$v_1 = \frac{l_1 - l_2}{t_1 - t_2}$

From Virtual Labs

$l_1 = 198.52$

$l_2 = 7.526$

$t_1 = 168.526$

$t_2 = -0.052$

$\therefore v = \frac{198.52 - 7.526}{168.52 - (-0.052)}$

$v = \underline{3.96 m/s}$

RESULTS :

We can understand that as we move the testing probe from the electrode, The velocity changes.
Thus we can analyze the response of muscle.

CONCLUSION :

Simulated the electromyogram Signal and analysed its characteristics.

PRACTICAL NO: 4

Date : 06/02/2025.

TITLE : Analyzing image and EEG signal frequency domain analysis using FFT in matlab.

AIM / OBJECTIVE: To apply FFT for EEG signal analysis, compute the power spectrum, extract alpha, Beta and thetha waves, and Visualize thier temporal variations.

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

~~Apparatus~~
EEG Signal data.
Matlab.

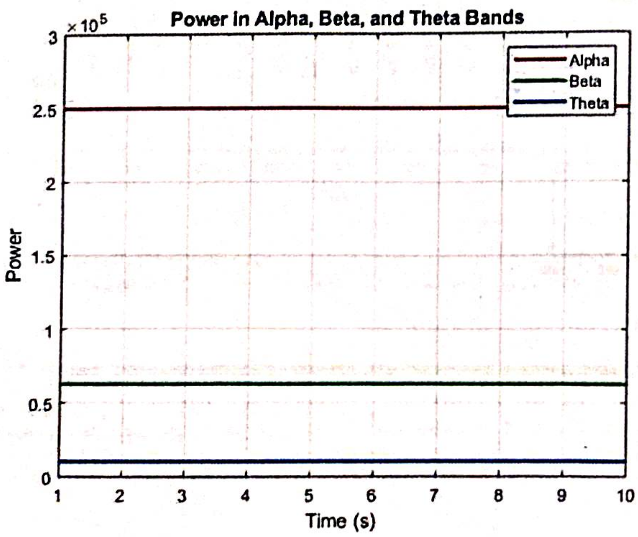
CONCEPT / THEORY OF EXPERIMENT:

EEG signal represents brain activity and contains frequency components linked to metal states FFT converts time domain signal into freq domain enabling power spectrum computation and frequency band extraction.
alpha 8-12 Hz, Beta 12-30 Hz, Theta 4-8 Hz

PROCEDURE :

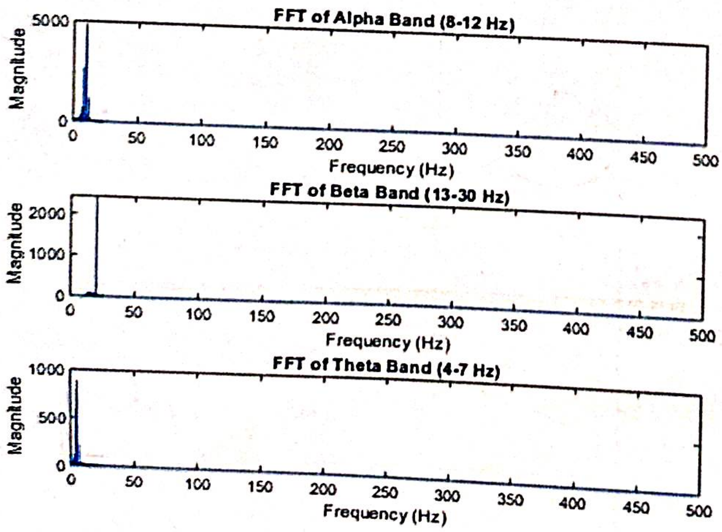
1 Load or generate EEG data in matlab.
2 Divide it into 1 sec frames.
3 Apply FFT to compute power spectrum.
4 Extract Alpha, Beta and thetha waves.
5. Plot their power variations over time.

```
% Generate a sample EEG signal
Fs = 1000; % Sampling frequency (Hz)
t = 0:1/Fs:10; % Time vector (10 seconds)
eeg_signal = sin(2*pi*10*t) + 0.5*sin(2*pi*20*t) + 0.2*sin(2*pi*5*t); % Sample EEG signal with frequencies 10 Hz, 20 Hz, and 5 Hz

% Frequency binning parameters
alpha_band = [8, 12]; % Alpha band frequencies (Hz)
beta_band = [13, 30]; % Beta band frequencies (Hz)
theta_band = [4, 7]; % Theta band frequencies (Hz)

% Prepare short 1-second frames of EEG signal
frame_length = Fs; % 1-second frame
num_frames = floor(length(eeg_signal) / frame_length);
frames = reshape(eeg_signal(1:num_frames*frame_length), frame_length, num_frames);

% Compute power spectrum and extract frequency bands for each frame
alpha_power = zeros(1, num_frames);
beta_power = zeros(1, num_frames);
theta_power = zeros(1, num_frames);

for i = 1:num_frames
    % Apply FFT to the frame
    frame_fft = fft(frames(:, i));

    % Compute power spectrum
    power_spectrum = abs(frame_fft).^2;

    % Extract frequency bins
    freqs = (0:frame_length-1) * Fs / frame_length;

    % Find indices corresponding to alpha, beta, and theta bands
    alpha_indices = find(freqs >= alpha_band(1) & freqs <= alpha_band(2));
    beta_indices = find(freqs >= beta_band(1) & freqs <= beta_band(2));
    theta_indices = find(freqs >= theta_band(1) & freqs <= theta_band(2));

    % Compute power in alpha, beta, and theta bands
    alpha_power(i) = sum(power_spectrum(alpha_indices));
    beta_power(i) = sum(power_spectrum(beta_indices));
    theta_power(i) = sum(power_spectrum(theta_indices));
end

% Plot the power in each frequency band over time
time = (1:num_frames) * (frame_length / Fs);
figure;
plot(time, alpha_power, 'r', 'LineWidth', 2);
hold on;
plot(time, beta_power, 'g', 'LineWidth', 2);
plot(time, theta_power, 'b', 'LineWidth', 2);
xlabel('Time (s)');
ylabel('Power');
title('Power in Alpha, Beta, and Theta Bands');
legend('Alpha', 'Beta', 'Theta');
grid on;
```



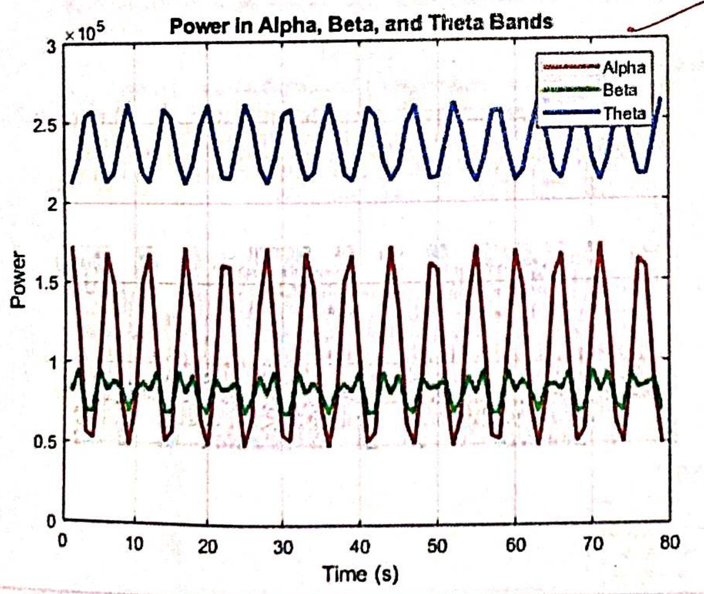

```
% Now let's calculate and plot the FFT of the Alpha, Beta, and Theta bands from the generated EEG signal
% Filter the EEG signal for alpha, beta, and theta bands
alpha_signal = zeros(size(eeg_signal));
beta_signal = zeros(size(eeg_signal));
```

```
theta_signal = zeros(size(eeg_signal));

for i = 1:num_frames
    % Extract the current frame
    frame = frames(:, i);

    % Apply bandpass filters to extract alpha, beta, and theta signals
    % Alpha band (8-12 Hz)
    alpha_signal((i-1)*frame_length + 1:i*frame_length) = bandpass(frame, alpha_band, Fs);

    % Beta band (13-30 Hz)
    beta_signal((i-1)*frame_length + 1:i*frame_length) = bandpass(frame, beta_band, Fs);

    % Theta band (4-7 Hz)
    theta_signal((i-1)*frame_length + 1:i*frame_length) = bandpass(frame, theta_band, Fs);
end

% Compute the FFT of the filtered signals
alpha_fft = fft(alpha_signal);
beta_fft = fft(beta_signal);
theta_fft = fft(theta_signal);

% Compute the frequency axis for the entire signal
N = length(eeg_signal); % Length of the full EEG signal
freqs = (0:N-1) * Fs / N; % Frequency axis

% Plot the FFT of alpha, beta, and theta signals
figure;
subplot(3, 1, 1);
plot(freqs, abs(alpha_fft));
title('FFT of Alpha Band (8-12 Hz)');
xlabel('Frequency (Hz)');
ylabel('Magnitude');
xlim([0 Fs/2]); % Limit x-axis to half the sampling frequency (Nyquist limit)

subplot(3, 1, 2);
plot(freqs, abs(beta_fft));
title('FFT of Beta Band (13-30 Hz)');
xlabel('Frequency (Hz)');
ylabel('Magnitude');
xlim([0 Fs/2]); % Limit x-axis to half the sampling frequency (Nyquist limit)

subplot(3, 1, 3);
plot(freqs, abs(theta_fft));
title('FFT of Theta Band (4-7 Hz)');
xlabel('Frequency (Hz)');
ylabel('Magnitude');
xlim([0 Fs/2]); % Limit x-axis to half the sampling frequency (Nyquist limit)
```




```
%If EEG csv file as input is given ,
% Read EEG signal from CSV file
eeg_data = csvread('C:\Users\student.SSPU\Downloads\Eeg_signal.csv'); % Assuming the CSV file contains one column representing

% Parameters
Fs = 1000; % Sampling frequency (Hz)
frame_length = Fs; % 1-second frame

% Frequency binning parameters
alpha_band = [8, 12]; % Alpha band frequencies (Hz)
beta_band = [13, 30]; % Beta band frequencies (Hz)
theta_band = [4, 7]; % Theta band frequencies (Hz)
```

```
'Prepare short 1-second frames of EEG signal
um_frames = floor(length(eeg_data) / frame_length);
rames = reshape(eeg_data(1:num_frames*frame_length), frame_length, num_frames);

; Compute power spectrum and extract frequency bands for each frame
ılpha_power = zeros(1, num_frames);
›eta_power = zeros(1, num_frames);
:heta_power = zeros(1, num_frames);

for i = 1:num_frames
% Apply FFT to the frame
frame_fft = fft(frames(:, i));

% Compute power spectrum
power_spectrum = abs(frame_fft).^2;

% Extract frequency bins

freqs = (0:frame_length-1) * Fs / frame_length;

% Find indices corresponding to alpha, beta, and theta bands
alpha_indices = find(freqs >= alpha_band(1) & freqs <= alpha_band(2));
beta_indices = find(freqs >= beta_band(1) & freqs <= beta_band(2));
theta_indices = find(freqs >= theta_band(1) & freqs <= theta_band(2));

% Compute power in alpha, beta, and theta bands
alpha_power(i) = sum(power_spectrum(alpha_indices));
beta_power(i) = sum(power_spectrum(beta_indices));
theta_power(i) = sum(power_spectrum(theta_indices));
end

% Plot the power in each frequency band over time
time = (1:num_frames) * (frame_length / Fs);
figure;
plot(time, alpha_power, 'r', 'LineWidth', 2);
hold on;
plot(time, beta_power, 'g', 'LineWidth', 2);
plot(time, theta_power, 'b', 'LineWidth', 2);
xlabel('Time (s)');
ylabel('Power');
title('Power in Alpha, Beta, and Theta Bands');
legend('Alpha', 'Beta', 'Theta');
grid on;
```



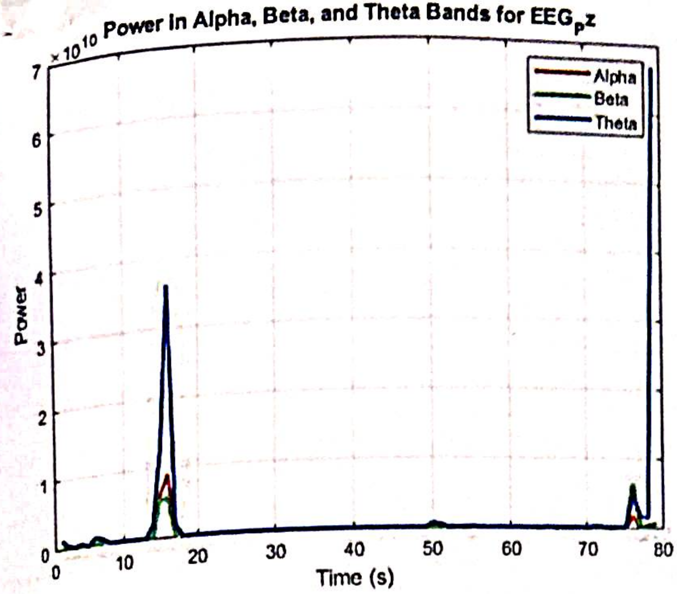

```
% Read EEG signal from CSV file
eeg_data = readtable('C:\Users\student.SSPU\Downloads\yash.csv');
```

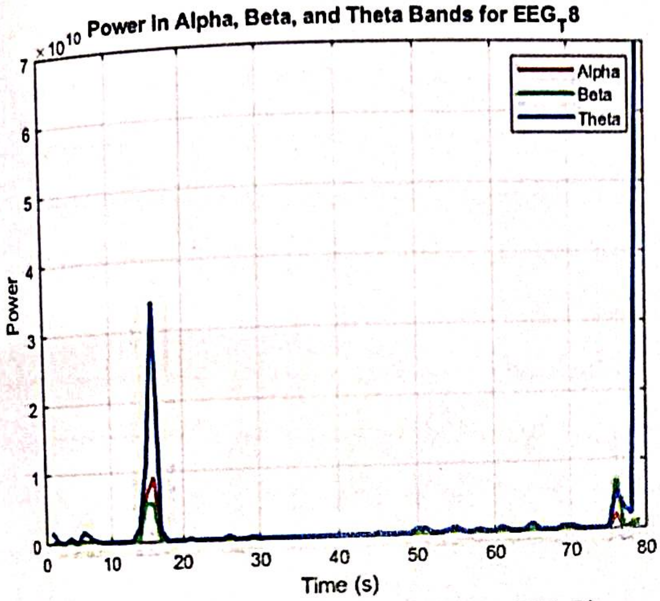
Warning: Variable names were modified to make them valid MATLAB identifiers. The original names are saved in the VariableDescriptions property.

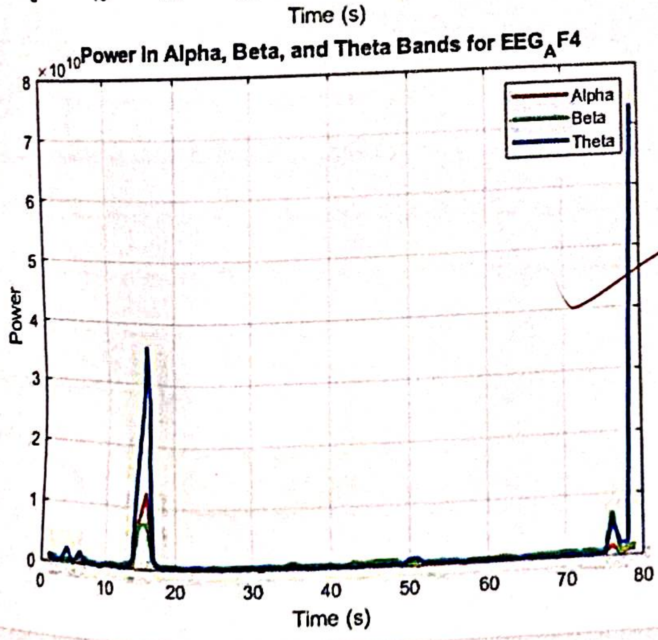
```
% Assuming the CSV file contains columns representing the EEG signals

% Display variable names to check modifications
disp(eeg_data.Properties.VariableNames);
```

    'EEG_AF3'   'EEG_T7'   'EEG_Pz'   'EEG_T8'   'EEG_AF4'

```
% Convert table to array by selecting the relevant columns
eeg_signals = eeg_data{:, 2:end}; % Adjust indices as necessary

% Parameters
Fs = 1000; % Sampling frequency (Hz)
frame_length = Fs; % 1-second frame
```


Power in Alpha, Beta, and Theta Bands for EEG_Pz
Alpha
Beta
Theta
Power
Time (s)


Power in Alpha, Beta, and Theta Bands for EEG_T8
Alpha
Beta
Theta
Power
Time (s)


Power in Alpha, Beta, and Theta Bands for EEG_AF4
Alpha
Beta
Theta
Power
Time (s)

CALCULATIONS :

* Applications
- Neuroscience research
- Brain computer interfaces
- Mental healt monitoring
- Sleep studies
- Congnitive Neuroscience
- Human factors Engineering
- Neurofeedback Therapy.

RESULTS :

FFT successfully analyzed EEG signals revealing frequency charaterstics and temporal variations.
This technique aids in neuroscience, psychology, and BCI research.

CONCLUSION :

Hence, able to perform the equipment for analyzing EEG signals using FFT in matlab.

PRACTICAL NO: 5

Date : 27/02/2025

TITLE : To Simulate Defibrillator

AIM / OBJECTIVE: 1 To simulate defibrillator output waveform
2. To understand energy levels, necessary and application of defibrillator.

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

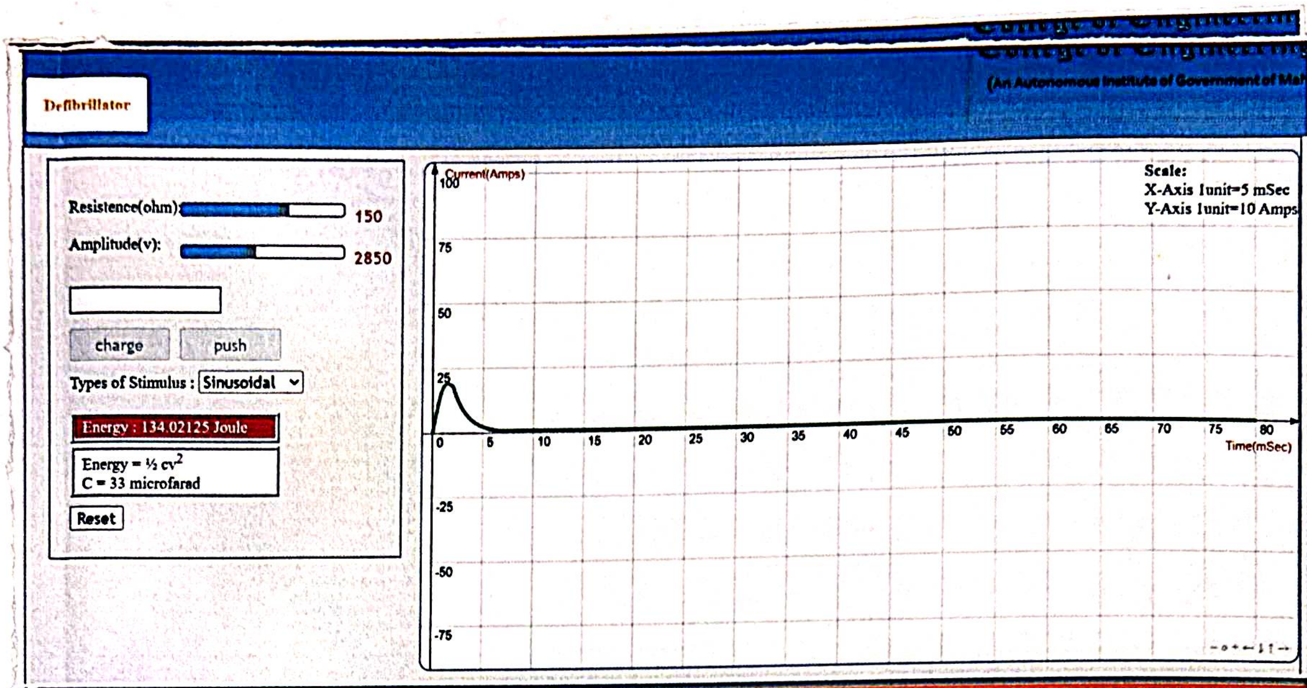
Virtual labs (Biomedical and signal processing)
Reference Notes.

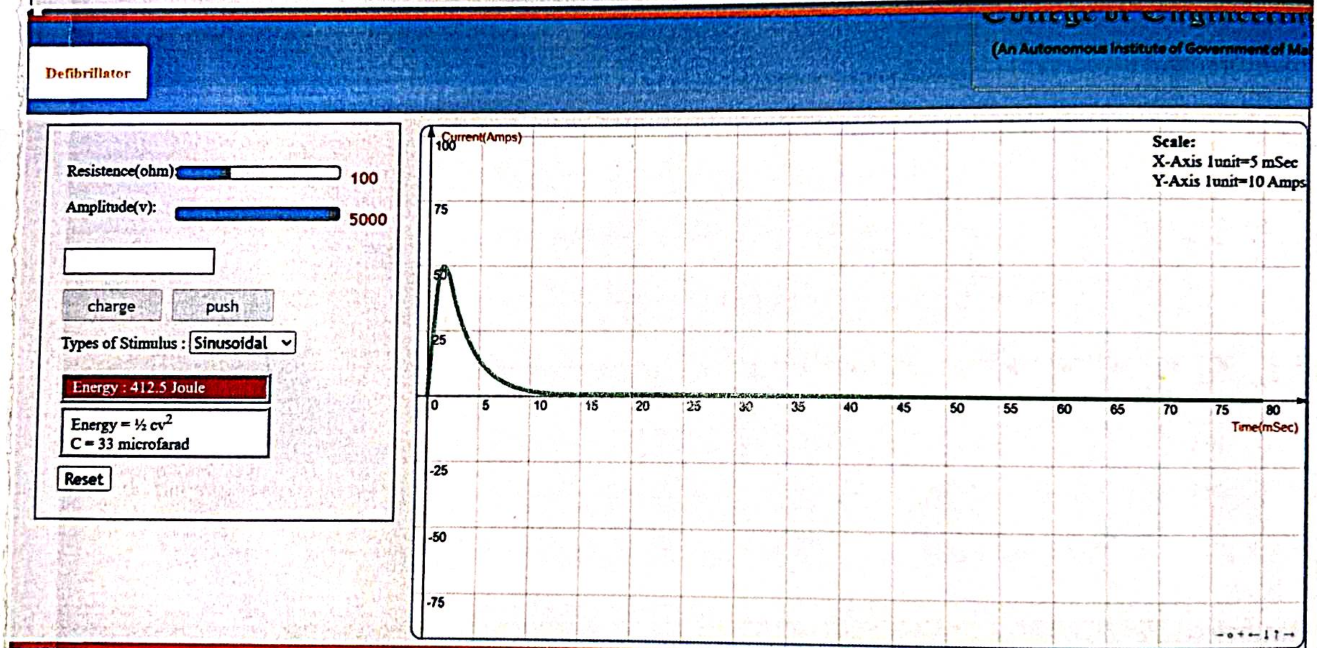
CONCEPT / THEORY OF EXPERIMENT:

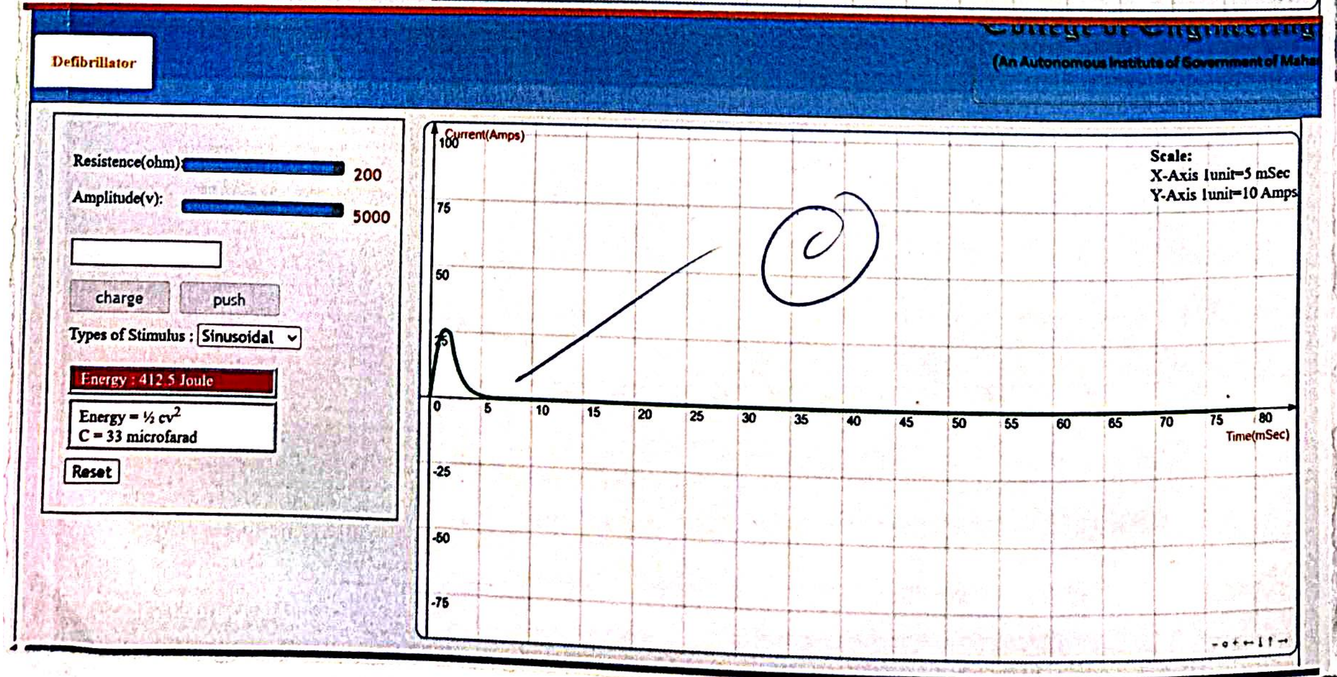
A defibrillator works by delivery a controlled electric shock to the heart restoring the normal rythm during cardiac arrest. This shock interrupt chaotic electrical conductivity allowing the heart to restore its natural operating pattern. Defibrillator are crucial in saving lives by quickly restoring heart function is emergency situations.

PROCEDURE :

1. Run the defibrillator simulator and observe discharging waveform.
2. Run the defibrillator and observe energy delivered by changing voltage.
3. Note down the waveforms of the defibrillator by changing the values
4. Understand the importance of defibrillator.


(An Autonomous Institute of Government of Mah
Defibrillator
Resistence(ohm):
150
Amplitude(v):
2850
charge
push
Types of Stimulus :
Sinusoidal
Energy : 134.02125 Joule
Energy = ½ cv2
C = 33 microfarad
Reset
Current(Amps)
Scale:
X-Axis 1unit=5 mSec
Y-Axis 1unit=10 Amps
Time(mSec)


(An Autonomous Institute of Government of Ma
Defibrillator
Resistence(ohm):
100
Amplitude(v):
5000
charge
push
Types of Stimulus :
Sinusoidal
Energy : 412.5 Joule
Energy = ½ cv2
C = 33 microfarad
Reset
Current(Amps)
Scale:
X-Axis 1unit=5 mSec
Y-Axis 1unit=10 Amps
Time(mSec)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Reset
Current(Amps)
Scale:
X-Axis 1unit=5 mSec
Y-Axis 1unit=10 Amps
Time(mSec)

OBSERVATIONS

- Energy levels :- Defibrillator typically generate energy levels ranging from 150 to 360 joules, crucial for restoring normal heart rythm during caradiac arrest.

- Necessity / Application :- They are necessary in emergency medical settings to retrive a stopped heart and sustain the by delivering controlled electric shock.

- Controls :- Common controls associated with defibrillator include energy level selection charging mechanism and shock delivering buttons, enabling health care provides and administer treatment effiectively.

- Configuration and types :- Defibrillator comes in various configuration such as manual semi automation and fully automatic, each offering different levels of user intervention, based on clinical requirement. Types includes external, implanted and wearable devices, serving diverse patient needs and medicals sceanarious with precision and efficiency.

- Energy stored in capacitor follows.

$$e = \frac{Cv^2}{2}$$

CALCULATIONS :

RESULTS :

We successfully simulated the output waveform of defibrillator.

CONCLUSION :

Here we were able to simulate ~~defibri~~ defibrillator output waveform.

PRACTICAL NO: 6

Date : 06/03/2025.

TITLE : To simulate Pacemaker

AIM / OBJECTIVE: To simulate the pacemaker output maker.

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

VLAB (Biomedical and Signal Processing)

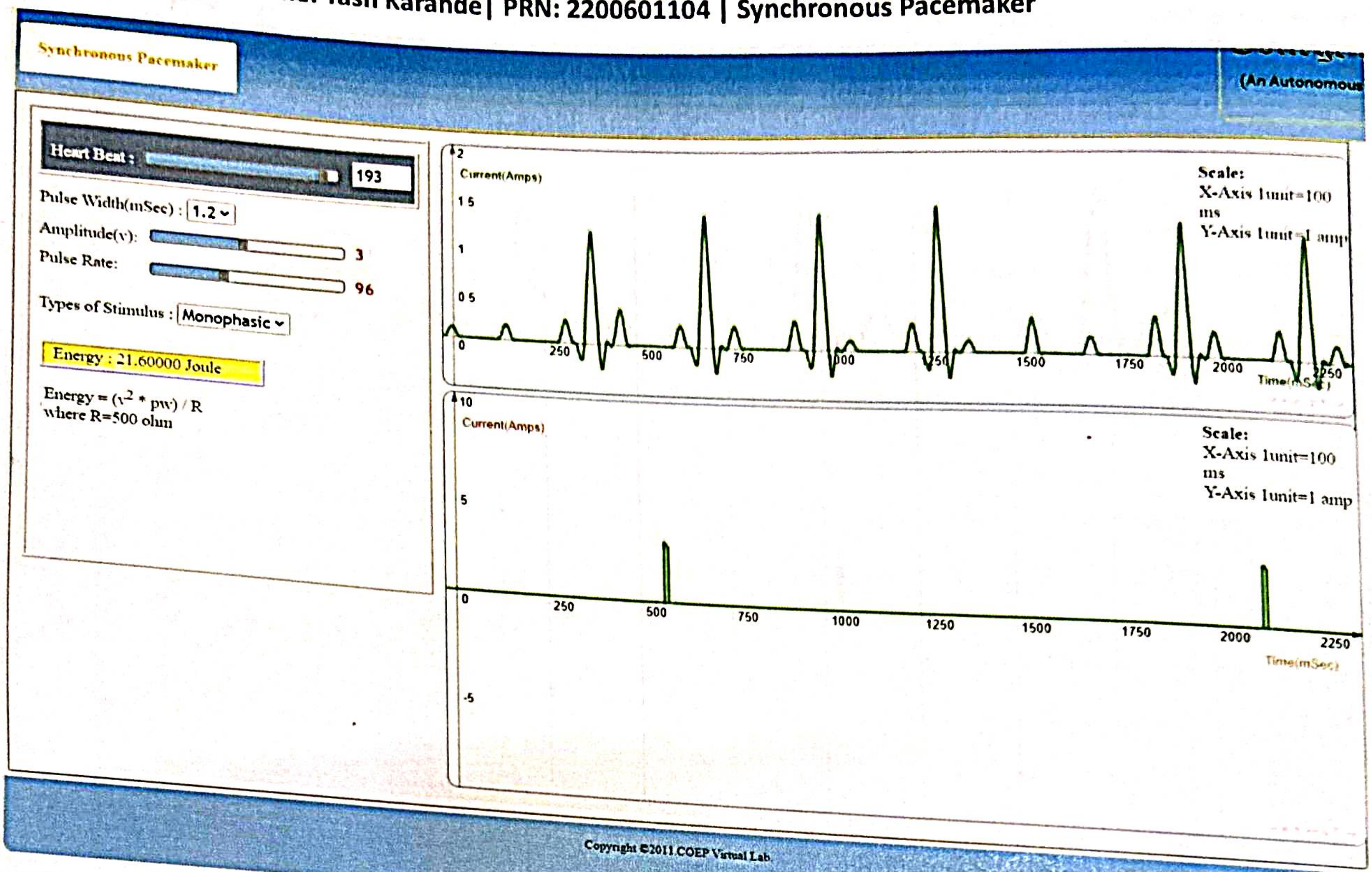
CONCEPT / THEORY OF EXPERIMENT:

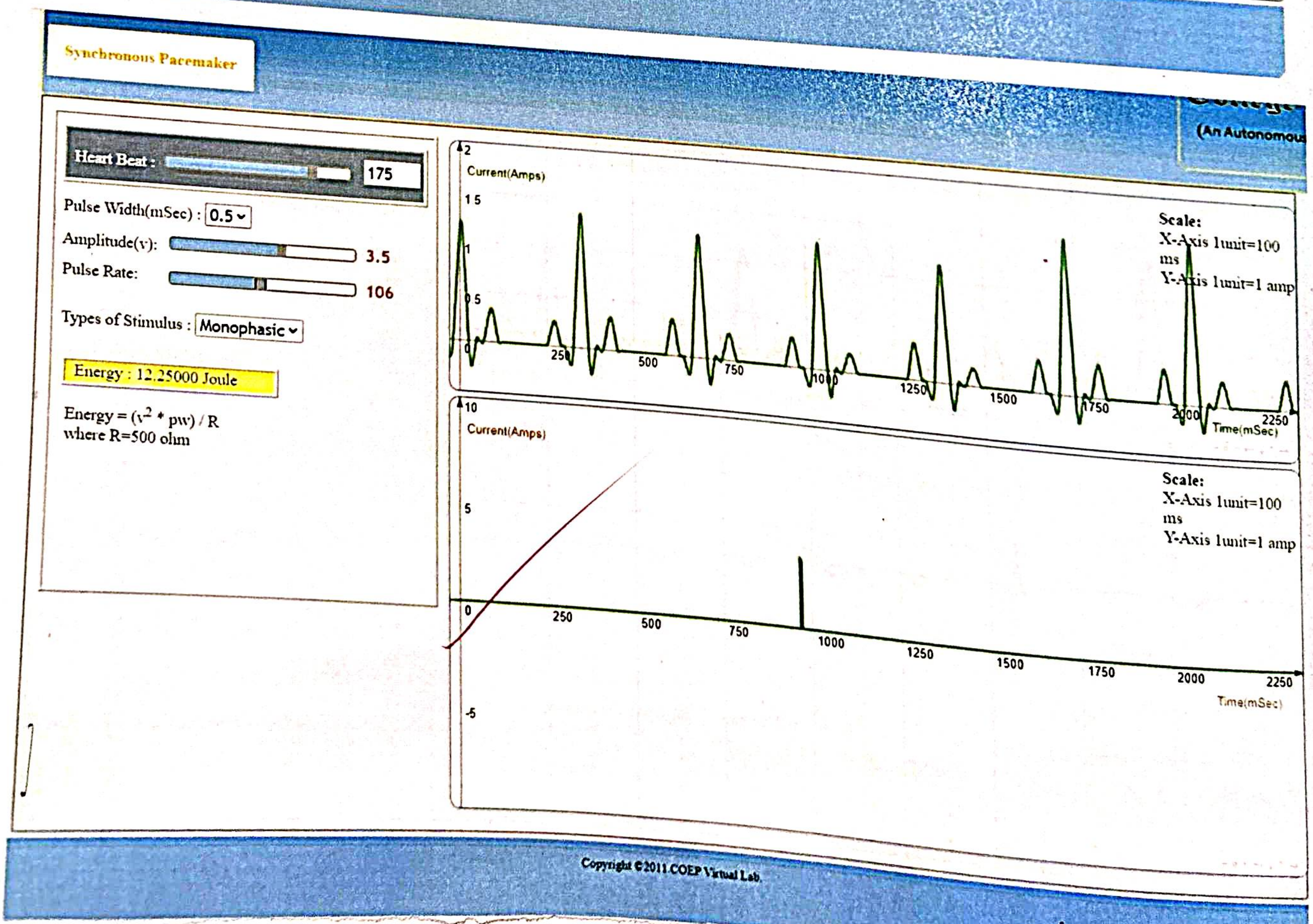
A pacemaker is a device implanted in the body to regulate abnormal heart rythm. It consists of a pulse generator and loads that deliver eletrical impulses to the heart to maintain a normal rhythm. This device continuosly monitors the heart electrical activity and delivers pulses. When needed to keep the heart beating at right pace.

PROCEDURE :

1) Run the pacemaker simulator and observe the monophasic and biphasic stimulus pulse.
2) Run the pacemaker simulator and observe stimulator pulse by varying the pulse width and voltage.
3) Run pacemaker simulator and observe the energy delivered from stimulus pulse.

Name: Yash Karande| PRN: 2200601104 | Synchronous Pacemaker





OBSERVATIONS

Pacemakers can be classified into two main types based on its location and how they are implanted.

* External pacemaker.

1. External pacemaker are temporary devices typically used in emergency situation.
2. They are not surgically implanted but rather attached adhesive electrode placed on the chest.
3. These are connected to the heart through temporary leads, which delivers electrical impulses to regulate the heart.
4. These are portable and provide short term support until a permanent solution is implemented.

* Internal Pacemaker.

1. Internal Pacemaker also known as implantable pacemaker are permanent devices implanted inside the body.
2. They consists of small generator and one or more leads that are inserted into the hearts through Veins.
3. Internal pacemaker continuously monitor the heart rythm and deliver electric pulse when necessary to regulate heartbeat.
4. Those pacemaker are programable and can be adjusted by health care proffesional to meet the specific needs of the patients.

CALCULATIONS :

RESULTS :

Hence we were able to simulate pacemaker output waveform.

CONCLUSION :

Hence we were able to understand concept of pacemaker and simulate its output waveform.

PRACTICAL NO: 7

Date : ____________

TITLE : To simulate overall functionally of Hemodialysis Machine (Artificial Kidney)

AIM / OBJECTIVE: 1. To understand the block schematic/ module involved in Hemodiatysis machine.

2. To understand various measurement and control involved in Hemodilaysis machine.

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

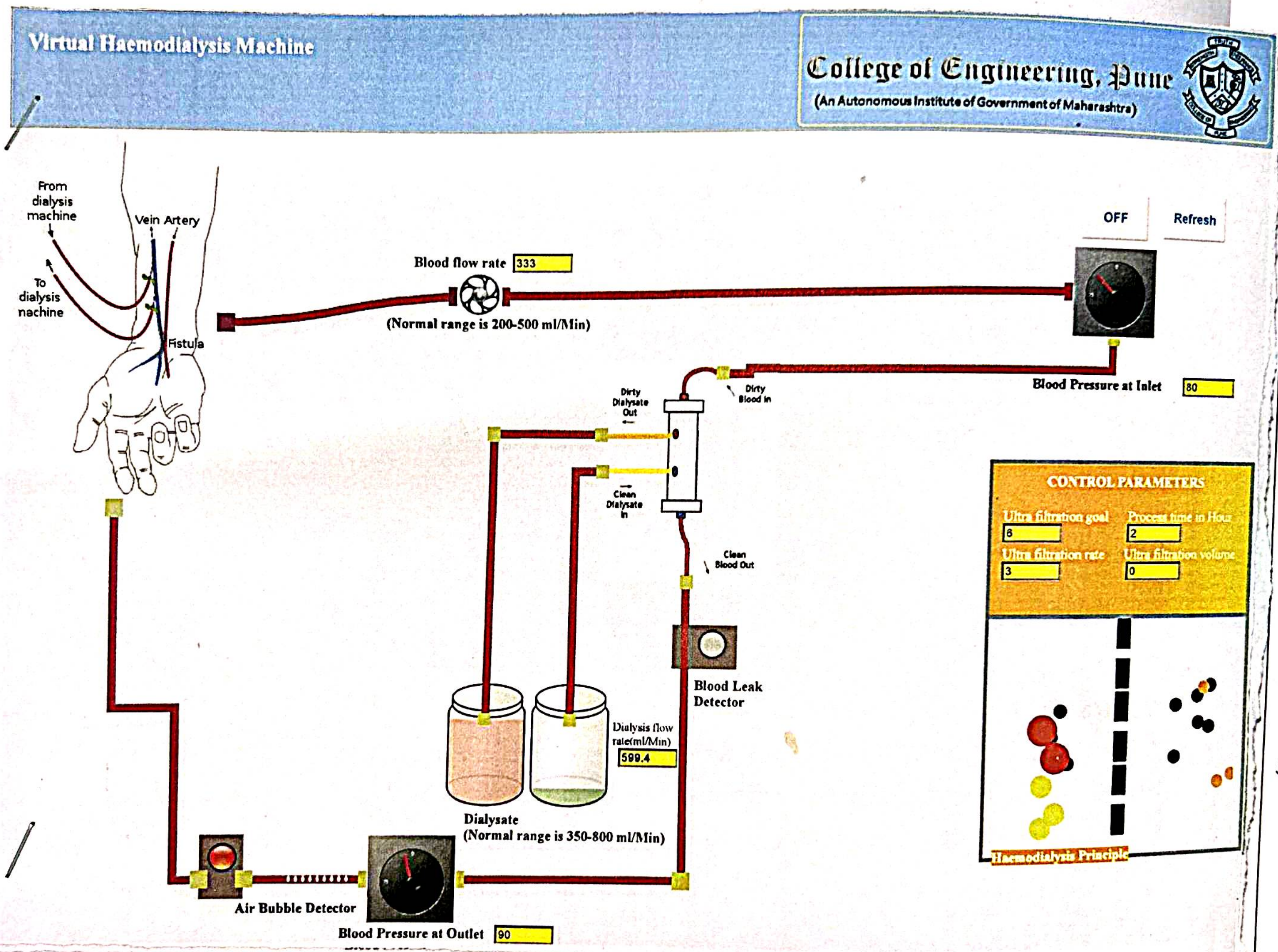
Virtual Lab.

CONCEPT / THEORY OF EXPERIMENT:

Hemo is greek word for blood. Dialysis means a filtering process. Hemodialysis means the process of filtering blood in the body. Hemodialysis is a method for removing waste products such as creatine and urea, as well as free water from the blood when the kidneys are in filteration failure.

PROCEDURE :

1) Set blood rate in normal given range.
2) Set control for ultra filteration goal and ultra filteration rate
3) set dialysate flow rate in normal given range.
4) Run virtual hemodialysis machine
5) Simulate Blood leak detector.
6) Simulate Air Bubble detector.


Virtual Haemodialysis Machine
College of Engineering, Pune
(An Autonomous Institute of Government of Maharashtra)
From dialysis machine
To dialysis nachine
Vein Artery
Fistula
OFF
Refresh
Blood flow rate 333
(Normal range is 200-500 ml/Min)
Blood Pressure at Inlet 80
Dirty Dialysate Out
Dirty Blood In
Clean Dialysate In
Clean Blood Out
CONTROL PARAMETERS
Ultra filtration goal 6
Process time in Hour 2
Ultra filtration rate 3
Ultra filtration volume 0
Haemodialysis Principle
Blood Leak Detector
Dialysis flow rate(ml/Min) 599.4
Dialysate
(Normal range is 350-800 ml/Min)
Air Bubble Detector
Blood Pressure at Outlet 90

OBSERVATIONS

* Blood flow.

The blood pump takes and return the return the blood from the patient via the artiel and venous needles respectively. The blood is confined to the disposable plastic tubing and doesnot come in contact with any part of the machine. The blood coming from the pump flow to the dialyzer returns to the patient through the veinous needle. The pump speed, and the resulting blood flow rate is adjustable.

* Blood Pressure.

The blood pressure is measured at both when it taken out from the limb and also when it is returned.

* Blood Flow Rate.

The effect of blood flow is easy to follow any change in pump speed is immediately reflected the pressure displays. The higher the flow the higher the pressure.

* Dialysis Process.

1. Concerning the blood, dialysis perform 2 different function that are normally done by heathy Kidney
2. Remoiving excess fluid.
3. Removing waste like urea and excess electrolytes like potassium, magnesium, sodium etc

CALCULATIONS :

RESULTS :

Here we are able to simulate the Hemodialysis machine.
(Artificial Kidney)

CONCLUSION :

Hence we are able to understand the concept of Hemodialysis machine.