# DAILY ASSESSMENT REPORT

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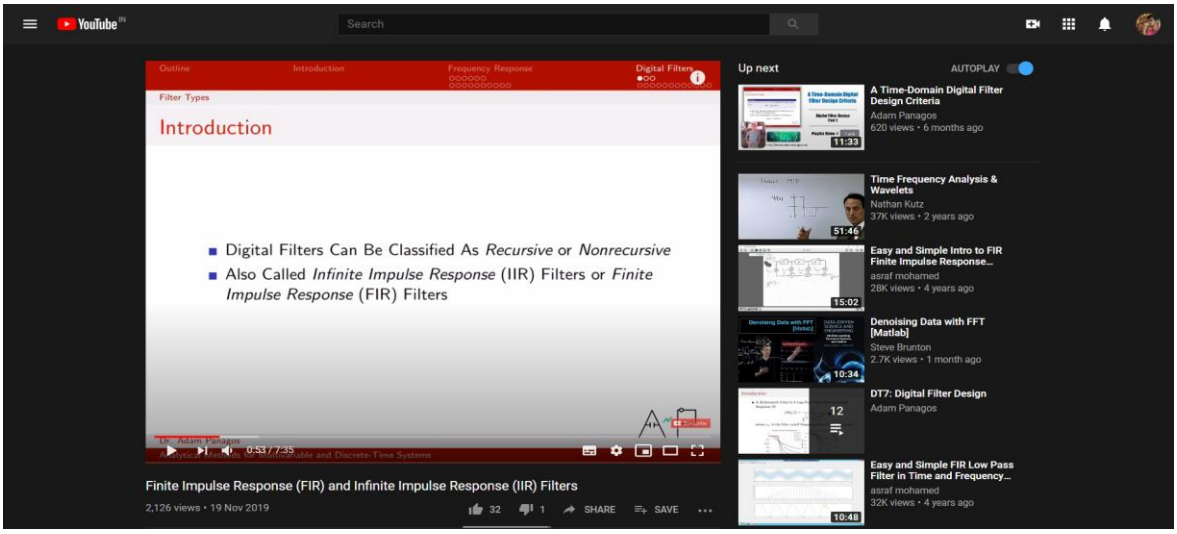
| **Date:** | **27 May 2020** | **Name:** | **Gagan M K** |
| **Course:** | **DIGITAL SIGNAL PROCESSING** | **USN:** | **4AL17EC032** |
| **Topic:** | • Fourier Transforms<br>• FFT<br>• FFT Fast Fourier Transform Matlab<br>• FIR and IIR Filters<br>• Study and analysis FIR and IIR using FDA tool in MatLab<br>• Introduction to WT<br>• CWT & DWT<br>• Implementation of signal Filtering signal using WT in MatLAb<br>• Short-time Fourier Transform and the Spectogram<br>• Welch's method and windowing<br>• ECG Signal Analysis Using MATLAB | **Semester & Section:** | **6th sem & 'A' sec** |
| **Github Repository:** | **Alvas-education-foundation/Gagan-Git** | | |

| **FORENOON SESSION DETAILS** |
|---|
| **Image of session** |



**Report – Report can be typed or hand written for up to two pages.**

## Fourier Transforms:

- **Digital Signal Processing/Discrete Fourier Transform. As the name implies, the Discrete Fourier Transform (DFT) is purely discrete: discrete-time data sets are converted into a discrete-frequency representation. This is in contrast to the DTFT that uses discrete time, but converts to continuous frequency.**

The function $F(s)$, defined by

$$F(s) = \int_{-\infty}^{\infty} f(x) \cdot e^{isx}\, dx$$

is called Fourier Transform of $f(x)$

- **The inverse Fourier transform is given as follows.**

Also, the function $f(x)$, defined by

$$f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(s) \cdot e^{-isx}\, ds$$

is called Inverse Fourier Transform of $F(s)$.
Inversion Formula

## Fast Fourier Transform:

$$X_p = \sum_{n=0}^{N-1} x_n \bullet W_N^{np} \qquad 0 \le p \le N-1$$

$$W_N \triangleq e^{-j\frac{2\pi}{N}}$$

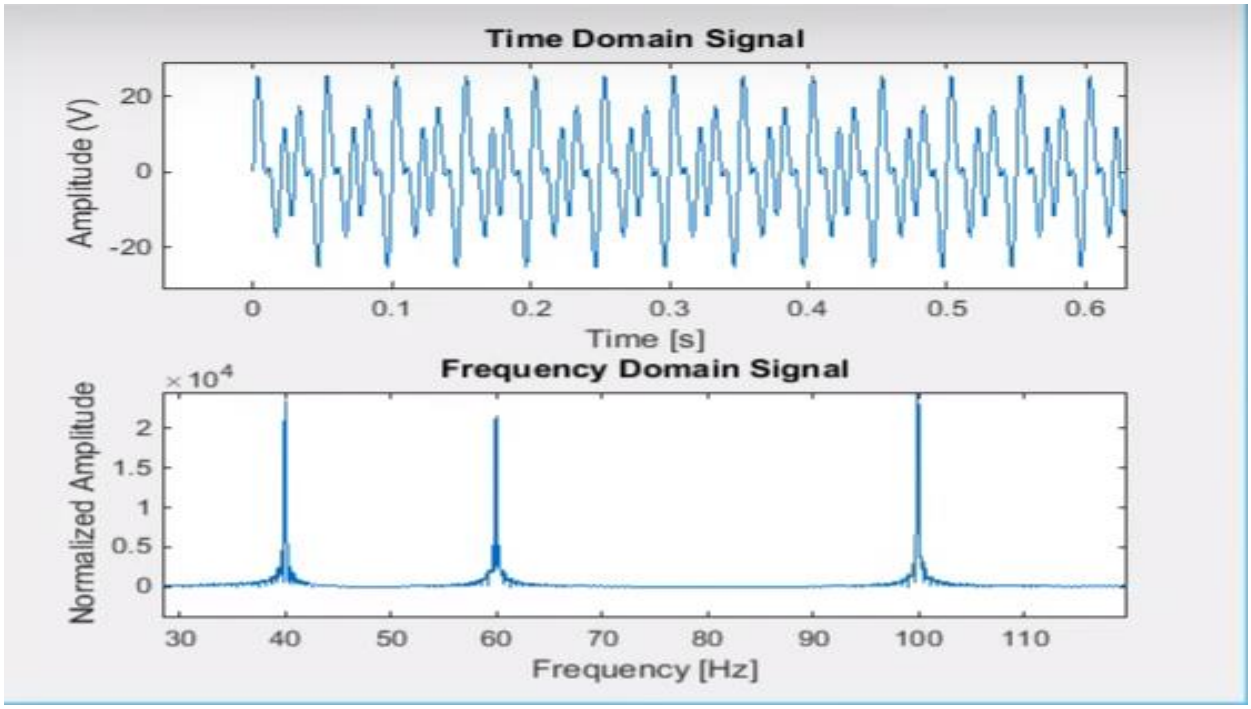
## FFT Fast Fourier Transform Matlab :

## Code:

```
Fs=1000; %sampling frequency
Ts=1/Fs; %sampling period or time step
dt=0:Ts:5-Ts; %signal duration
f1=10;
f2=30;
f3=70;

% y=Asin(2pift+theta);

y1=10*sin(2*pi*f1*dt);
y2=10*sin(2*pi*f2*dt);
y3=10*sin(2*pi*f3*dt);
y4=y1+y2+y3;

% subplot(4,1,1);
% plot(dt,y1,'r');
% subplot(4,1,2);
% plot(dt,y2,'r');
% subplot(4,1,3);
% plot(dt,y3,'r');
% subplot(4,1,4);
% plot(dt,y4,'r');
```

```
nfft=length(y4); % length of time domain signal
nfft2=2^nextpow2(nfft); % length of signal in power of 2
ff=fft(y4,nfft2);

plot(abs(ff));
```

## Output:



## FIR and IIR Filters:

### 1. FIR Filter

- **Consider the function described by the transfer function.**

$$H(z) = \frac{b_3 z^3 + b_2 z^2 + b_1 z + b_0}{z^3}$$

- **The corresponding difference equation.**

$$y[k] = b_3 f[k] + b_2 f[k-1] + b_1 f[k-2] + b_0 f[k-3]$$

### 2. IIR Filter

- **Consider the function described by the transfer function.**

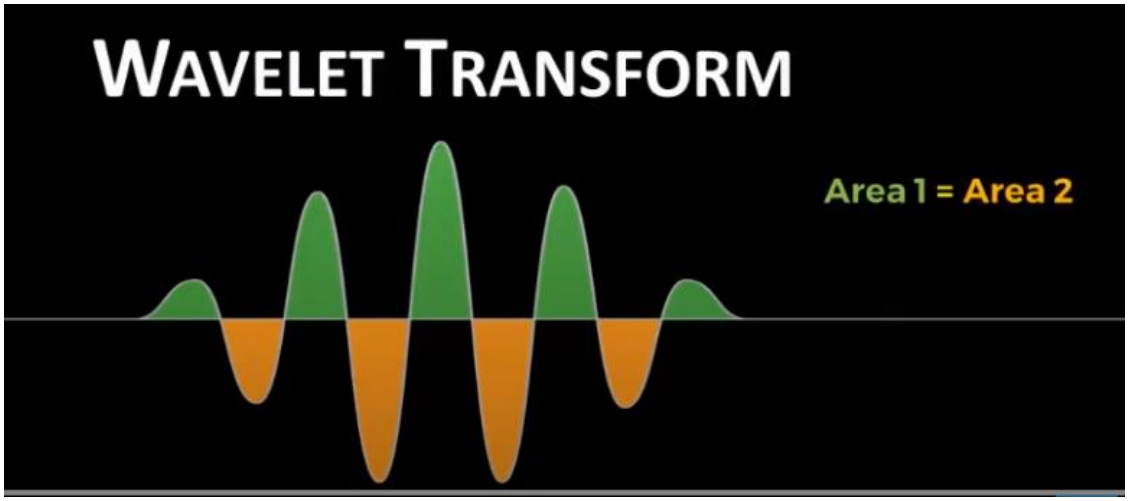
$$H(z) = \frac{b_3 z^3 + b_2 z^2 + b_1 z + b_0}{z^3 + a_2 z^2 + a_1 z + a_0}$$

- **The corresponding difference equation.**

$$\begin{aligned} y[k] &= -a_2 y[k-1] - a_1 y[k-2] - a_0 y[k-3] \\ &+ b_3 f[k] + b_2 f[k-1] + b_1 f[k-2] + b_0 f[k-3] \end{aligned}$$

## Introduction to WT:

- **A wavelet transform (WT) is the decomposition of a signal into a set of basis functions consisting of contractions, expansions, and translations of a mother function ψ(t), called the wavelet (Daubechies, 1991).**



## Implementation of signal Filtering signal using WT in MatLAb:

## Code:

```
clear all
[k,Fs] = audioread('man_voice.wav');
k = k * 0.5 / rms(k);
k = awgn(k,12,'measured');
[c,l] = wavedec(k,3,'db4');
b = wthresh(c,'s',0.15);
y = waverec(b,l,'db4');
y = y * 0.5/rms(y);
sound(y,Fs);
```

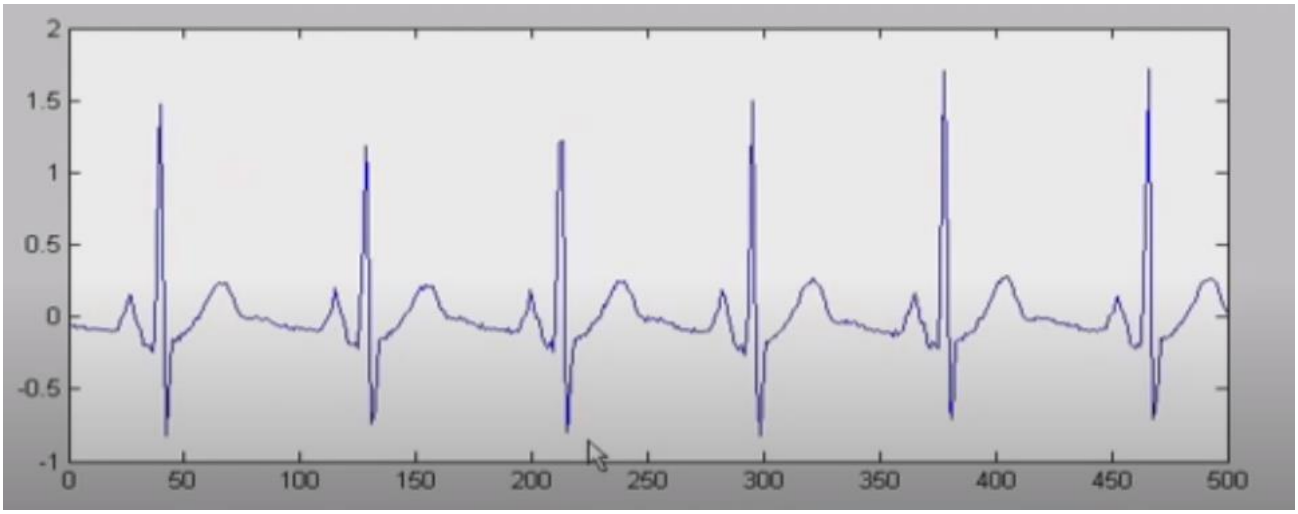
## Short-time Fourier Transform and the Spectogram:

- **The Short-time Fourier transform (STFT), is a Fourier-related transform used to determine the sinusoidal frequency and phase content of local sections of a signal as it changes over time.**
- **In practice, the procedure for computing STFTs is to divide a longer time signal into shorter segments of equal length and then compute the Fourier transform separately on each shorter segment.**
- **This reveals the Fourier spectrum on each shorter segment. One then usually plots the changing spectra as a function of time, known as a spectrogram or waterfall plot.**

## Welch's method and windowing :

- **Welch's method [296] (also called the periodogram method) for estimating power spectra is carried out by dividing the time signal into successive blocks, forming the periodogram for each block, and averaging. is the rectangular window, the periodograms are formed from non-overlapping successive blocks of data.**

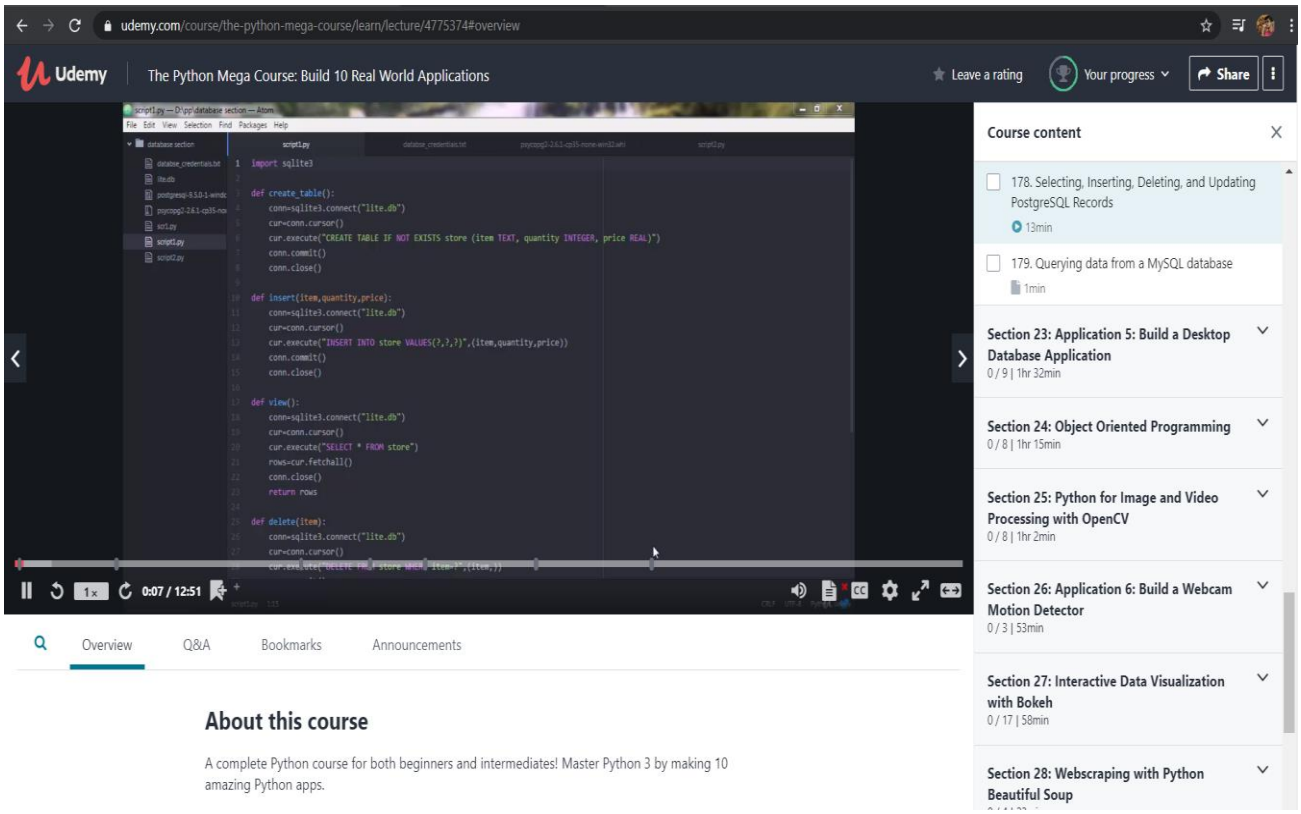
## ECG Signal Analysis Using MATLAB:



| Date: | 27 May 2020 | Name: | Gagan M K |
|---|---|---|---|
| Course: | The Python Mega Course | USN: | 4AL17EC032 |
| Topic: | • Graphical User Interfaces with Tkinter<br>• Interacting with Databases | Semester & Section: | 6th sem & 'A' sec |

**AFTERNOON SESSION DETAILS**

**Image of session:**



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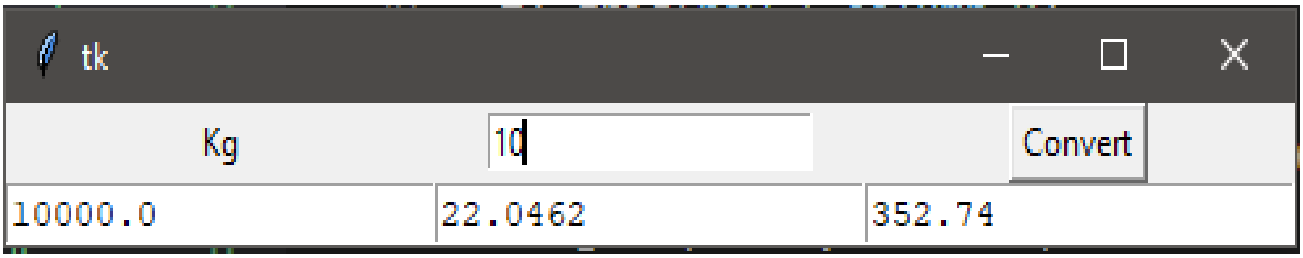
## GRAPHICAL USER INTERFACES WITH TKINTER:

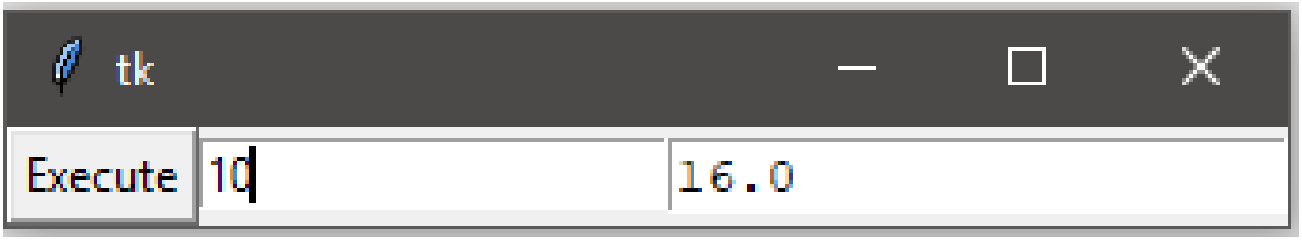
- **Python offers multiple options for developing GUI (Graphical User Interface).**
- **Out of all the GUI methods, tkinter is the most commonly used method.**
- **It is a standard Python interface to the Tk GUI toolkit shipped with Python. Python with tkinter is the fastest and easiest way to create the GUI applications.**
- **Creating a GUI using tkinter is an easy task.**

## INTERACTING WITH DATABASES:

- **Given the variety of techniques available to produce protein-protein interaction data and the large number of studies that are published every day, an enormous effort is required to store this information in a way that is both accessible and intelligible to the user.**
- **Molecular interaction databases aim to fulfil this need by extracting information from scientific publications or, in some cases, by including protein-protein interaction predictions found using computational method. The storage of interactions in publicly available databases allows access to a large volume of interaction data and subsequent analysis of the interactome**




- **The above image converts Kg into Grams, pounds and ounces respectively.**




- **The above image converts Kilo meter into Miles.**