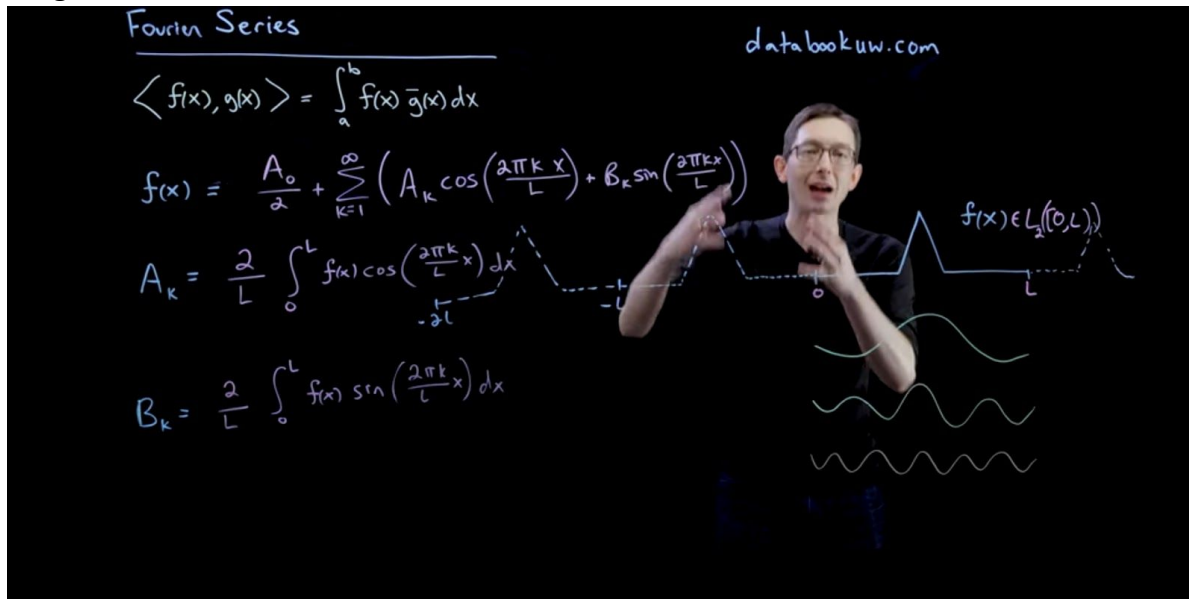


DAILY ASSESSMENT FORMAT

Date:	25-05-2020	Name:	MOUNITHA D M
Course:	Digital Signal Processing	USN:	4AL17EC055
Topic:	Fourier Transform, Fourier Series	Semester & Section:	6 TH SEM "A" SEC
Github Repository:	Mounitha_-ec055		

FORENOON SESSION DETAILS

Image of session

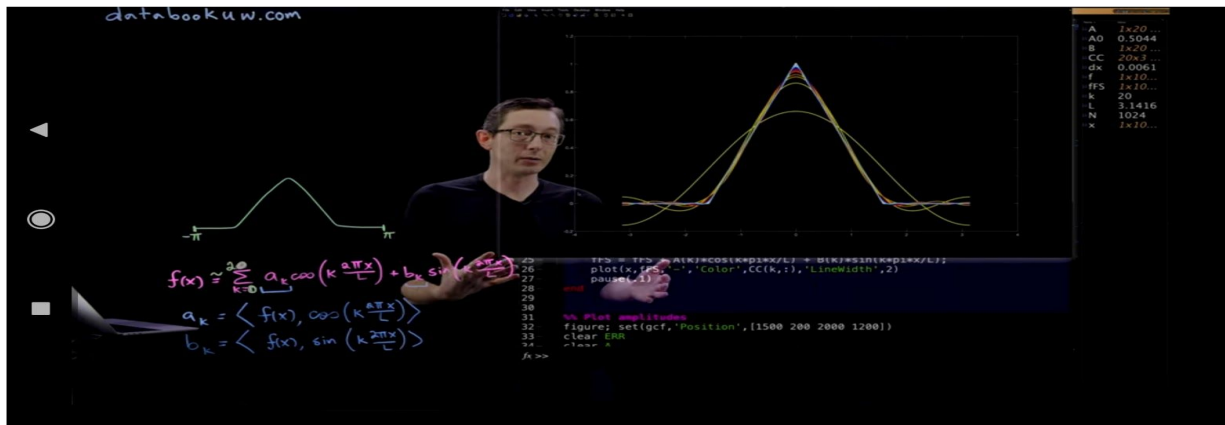
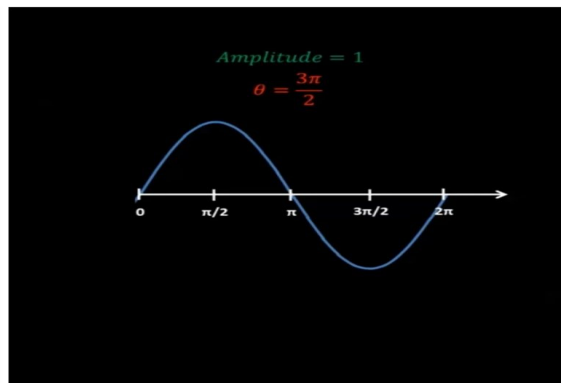
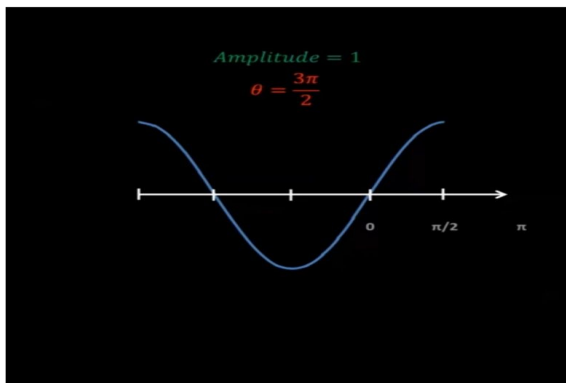
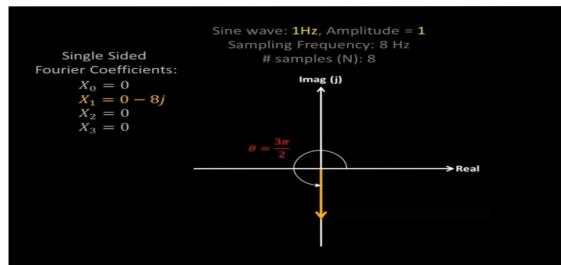
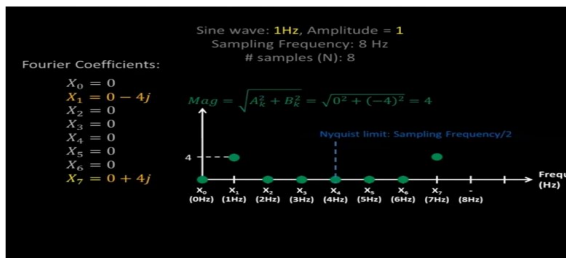


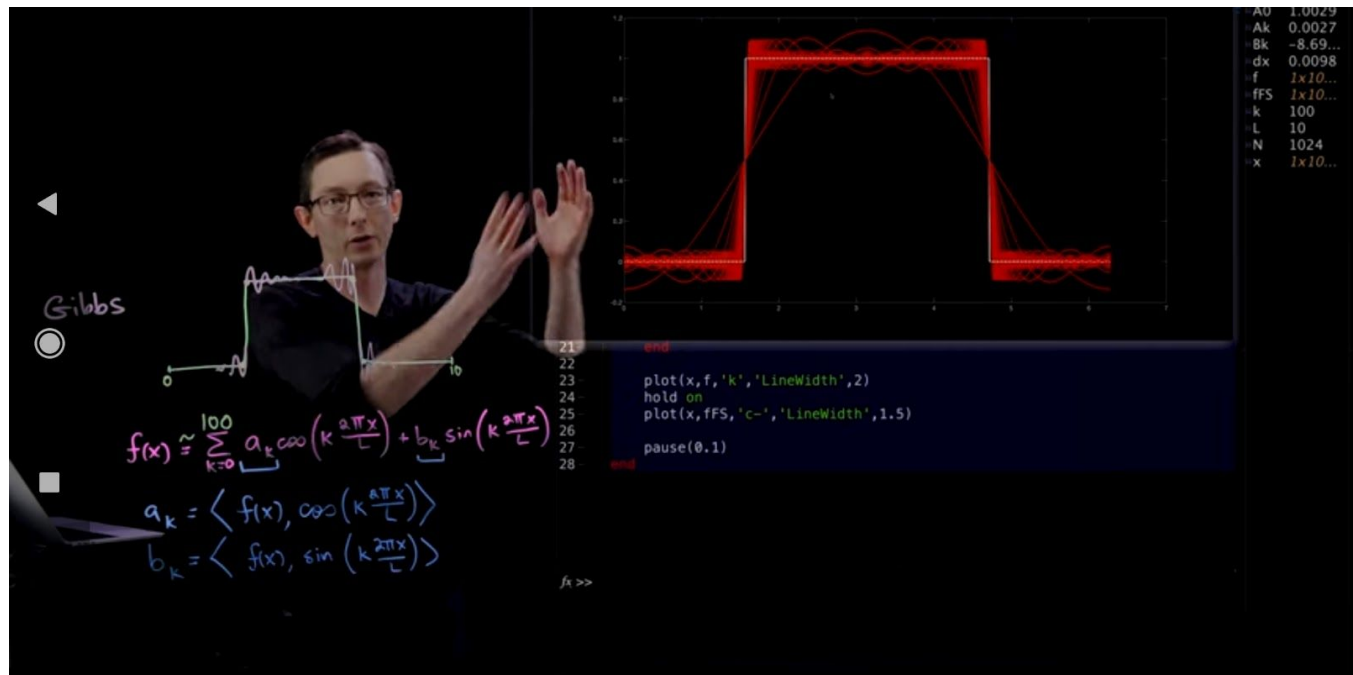
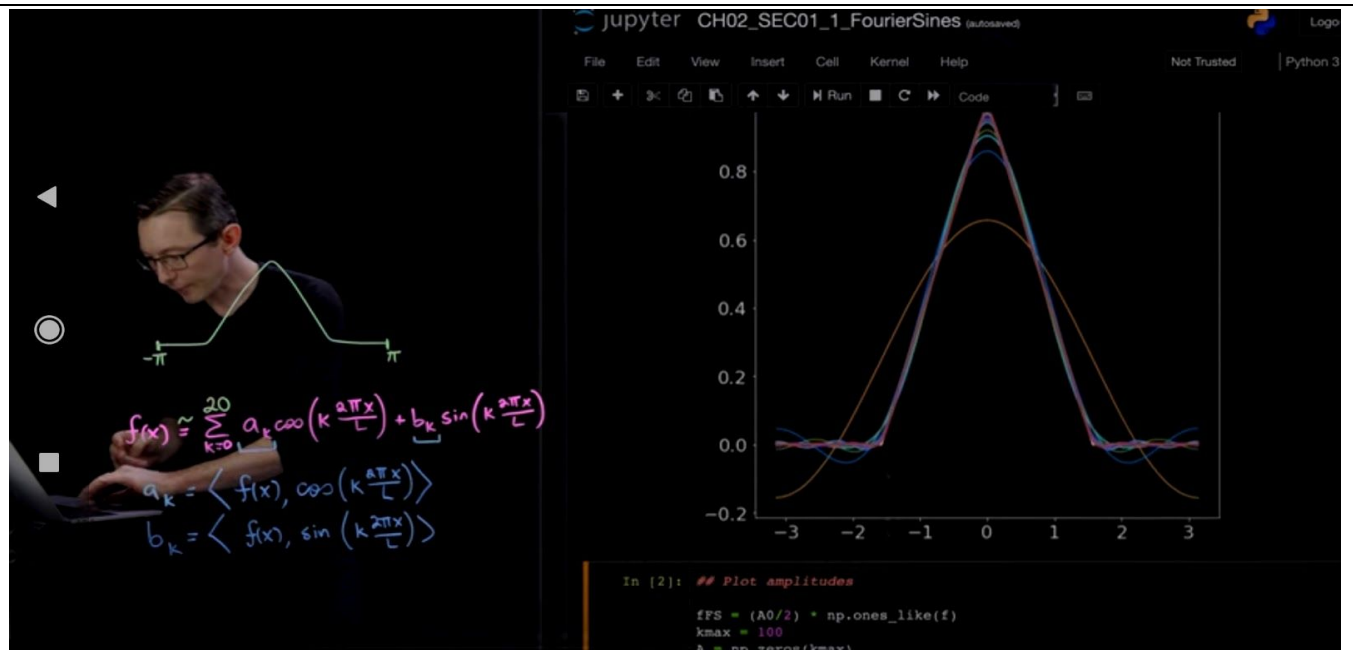
Sine wave: **1Hz**, Amplitude = **1**
 Sampling Frequency: 8 Hz
 # samples (N): 8

"kth" frequency bin $\rightarrow X_k = \sum_{n=0}^{N-1} x_n \cdot e^{-\frac{j 2\pi kn}{N}}$

$x_0 = 0$
 $x_1 = 0.707$
 $x_2 = 1$
 $x_3 = 0.707$
 $x_4 = 0$
 $x_5 = -0.707$
 $x_6 = -1$
 $x_7 = -0.707$

$X_2 = 0 \cdot e^{-\frac{j 2\pi(2)(0)}{8}} + 0.707 \cdot e^{-\frac{j 2\pi(2)(1)}{8}} + 1 \cdot e^{-\frac{j 2\pi(2)(2)}{8}} + \dots$
 $X_2 = 0 + 0.707 \left[\cos\left(-\frac{\pi}{2}\right) + j \sin\left(-\frac{\pi}{2}\right) \right] + 1 [\cos(-\pi) + j \sin(-\pi)] + \dots$
 $X_2 = 0 + (-0.707j) + (-1) + (0.707j) + (0.707j) + (1) + (-0.707j)$





①

Digital Signal processing

25/5/2020

Day - 1

Introduction to Fourier Series & Fourier Transform

Fourier Transform

The Fourier Transform is a tool that breaks a waveform (a function or signal) into an alternate representation, characterized by sine and cosine.

Fourier Series

These periodic functions can be analyzed into their constituent components (fundamental and harmonics) by a process called Fourier Analysis.

Periodic Signal \rightarrow $\left\{ \begin{array}{l} \text{Continuous Time Fourier Series} \\ \text{Discrete Time Fourier Series} \end{array} \right\}$ Periodic Signal

Non periodic Signal \rightarrow $\left\{ \begin{array}{l} \text{Continuous Time Fourier Transform} \\ \text{Discrete Time Fourier Transform} \end{array} \right\}$

\rightarrow Laplace Transform \rightarrow Continuous Time

\rightarrow Z-Transform \rightarrow Discrete Time

Fourier Series part-1

$$\langle f(x), g(x) \rangle = \int_a^b f(x) g(x) dx$$

$$f(x) = \sum_{k=1}^{\infty} (A_k \cos(kx) + B_k \sin(kx))$$

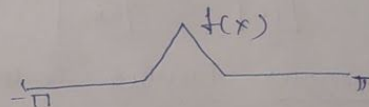
$$f(x) = \frac{A_0}{2} + \sum_{k=1}^{\infty} (A_k \cos(kx) + B_k \sin(kx))$$

$$A_k = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos(kx) dx = \frac{1}{\cos(kx)^2} \langle f(x), \cos(kx) \rangle$$

$$B_k = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \sin(kx) dx = \frac{1}{\sin(kx)^2} \langle f(x), \sin(kx) \rangle$$

$$\vec{F} = \langle \vec{F}, \vec{x} \rangle \frac{\vec{x}}{\|\vec{x}\|^2} + \langle \vec{F}, \vec{y} \rangle \frac{\vec{y}}{\|\vec{y}\|^2}$$

$$= \langle \vec{F}, \vec{u} \rangle \frac{\vec{u}}{\|\vec{u}\|^2} + \langle \vec{F}, \vec{v} \rangle \frac{\vec{v}}{\|\vec{v}\|^2}$$



Fourier Series part-2

(2)

$$\langle f(x), g(x) \rangle = \int_a^b f(x) \bar{g}(x) dx$$

$$f(x) = \frac{A_0}{2} + \sum_{k=1}^{\infty} \left(A_k \cos\left(\frac{2\pi k x}{L}\right) + B_k \sin\left(\frac{2\pi k x}{L}\right) \right)$$

$$A_k = \frac{2}{L} \int_0^L f(x) \cos\left(\frac{2\pi k x}{L}\right) dx$$

$$B_k = \frac{2}{L} \int_0^L f(x) \sin\left(\frac{2\pi k x}{L}\right) dx$$

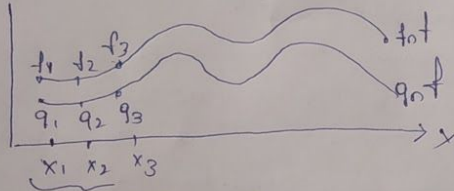
Inner product in Hilbert Transform

$$\langle f(x), g(x) \rangle = \int_a^b f(x) \bar{g}(x) dx$$

$$\langle f, g \rangle = g^* f = g \cdot f$$

$$= \sum_{k=1}^n f_k \bar{g}_k$$

$$\langle f, g \rangle \Delta x = \sum_{k=1}^n f(x_k) \bar{g}(x_k)$$



$$\Delta x = \frac{b-a}{n-1}$$

$$f = \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_n \end{bmatrix} \quad g = \begin{bmatrix} g_1 \\ g_2 \\ \vdots \\ g_n \end{bmatrix}$$

Complex Fourier Series

$$f(x) = \sum_{k=-\infty}^{\infty} c_k e^{ikx} = \sum_{k=-\infty}^{\infty} (\alpha_k + i\beta_k) (\cos(kx) + i\sin(kx))$$

$$(c_k = \bar{c}_{-k} \text{ if } f(x) \text{ is real})$$

$$e^{ikx} = \cos(kx) + i\sin(kx) = \psi_k$$

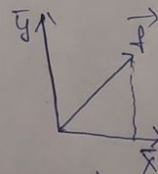
$$\langle \psi_j, \psi_k \rangle = \int_{-\pi}^{\pi} e^{ijx} e^{-ikx} dx$$

$$= \int_{-\pi}^{\pi} e^{i(j-k)x} dx$$

$$= \frac{1}{i(j-k)} \left[e^{i(j-k)x} \right]_{-\pi}^{\pi}$$

$$\text{if } j \neq k$$

$$\text{if } j = k$$



$$\vec{f} = \langle \vec{f}, \vec{x} \rangle \vec{x} + \langle \vec{f}, \vec{y} \rangle \vec{y}$$



REDMI NOTE 5 PRO
MI DUAL CAMERA

$$f(x) = \sum_{k=-\infty}^{\infty} c_k e^{ikx} = \sum_{k=-\infty}^{\infty} (\alpha_k + i\beta_k) (\cos(kx) + i\sin(kx)) \quad (3)$$

$$= \frac{1}{2\pi} \sum_{k=-\infty}^{\infty} \underbrace{\langle f(x), \psi_k \rangle}_{c_k} \underbrace{\psi_k}_{e^{ikx}}$$

Fourier Series using Matlab

(Use octave to execute the code.)

$$f(x) = \sum_{k=1}^{\infty} a_k \cos\left(k \frac{2\pi x}{L}\right) + b_k \sin\left(k \frac{2\pi x}{L}\right)$$

$$a_k = \langle f(x), \cos\left(k \frac{2\pi x}{L}\right) \rangle$$

$$b_k = \langle f(x), \sin\left(k \frac{2\pi x}{L}\right) \rangle$$



clear all;

close all;

clc

figure

set(gcf, 'position', [1500, 200, 2000, 1200])

Define domain

L = pi;

N = 1024;

dx = 2 * L / (N - 1);

x = -L : dx : L;

Define hat function

f = zeros(1, N);

f(N/4 : N/2) = 4 * (1 : N/4 + 1) / N;

f(N/2 + 1 : 3 * N/4) = 4 * (N/4 - 1 : N/4) / N;

plot(x, f, 'k', 'linewidth', 3.5), hold on

axis([-pi, pi, 0, 20]);

A0 = sum(f) * ones(size(x)) * dx / pi;

FS = A0/2;

for k = 1 : 20

A(k) = sum(f .* cos(pi * k * x / L)) * dx / pi;

B(k) = sum(f .* sin(pi * k * x / L)) * dx / pi;

Fourier Series using python

(Experience Implementation using python)

```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.cm import get_cmap

plt.rcParams['figure', 'figsize'] = [8, 8]
plt.rcParams.update({'font.size': 18})

# Define domain
dx = 0.001
L = np.pi
X = L * np.arange(-1+dx, 1+dx, dx)
n = len(X)
nquant = int(np.floor(n/4))

# Define hat function
f = np.zeros_like(X)
f[nquant*2:nquant*2] = 1/n * np.arange(1, nquant+1)
f[2*nquant:3*nquant] = np.ones(nquant) * (1/n) * np.arange(1, nquant)

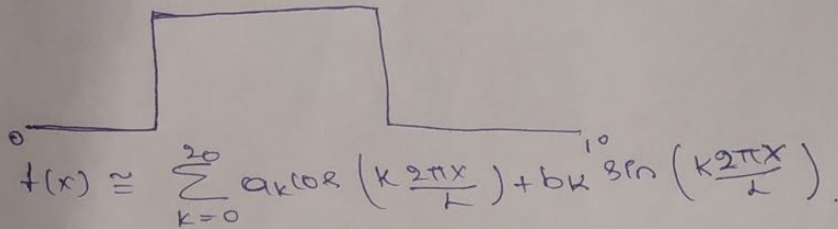
fig, ax = plt.subplots()
ax.plot(X, f, '-', color='k', linewidth=2)

# Compute Fourier Series.
name = "Accent"
cmap = get_cmap('tab10')
coloss = cmap.coloss
ax.set_prop_cycle(color=coloss)
A0 = np.sum(f * np.ones_like(X)) * dx
FS = A0/2

A = np.zeros(20)
B = np.zeros(20)

for k in range(20):
    A[k] = np.sum(f * np.cos(np.pi*(k+1)*X/L)) * dx
    B[k] = np.sum(f * np.sin(np.pi*(k+1)*X/L)) * dx
```

Matlab



$$f(x) \approx \sum_{k=0}^{20} a_k \cos\left(k \frac{2\pi x}{L}\right) + b_k \sin\left(k \frac{2\pi x}{L}\right).$$

$$a_k = \langle f(x) \cdot \cos\left(k \frac{2\pi x}{L}\right) \rangle$$

$$b_k = \langle f(x) \cdot \sin\left(k \frac{2\pi x}{L}\right) \rangle.$$

clear all

close all

clc

L = 10;

Nk = 1024;

dx = L / (Nk - 1);

x = 0; dx:L;

f = zeros(size(x));

f = (256:768) * f;

A0 = sum(f * ones(size(x))) * dx * 2/L;

fFS = A0/2;

for K = 1:100

AK = sum(f * cos(2*pi*K*x/L)) * dx * 2/L;

BK = sum(f * sin(2*pi*K*x/L)) * dx * 2/L;

fFS = fFS + AK * cos(2*pi*K*x/L) + BK * sin(2*pi*K*x/L);

End

plot(x, f, 'k', 'linewidth', 4), hold on

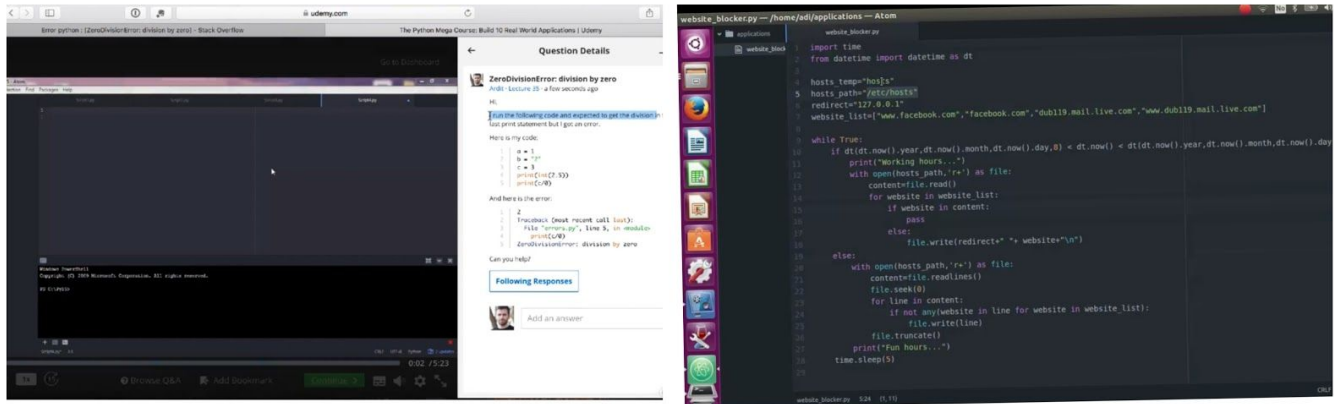
plot(x, fFS, 'c-', 'linewidth', 3)

axis([0 10 -1500 1500])

DATE	25-05-2020	Name:	MOUNITHA DM
Course:	PYTHON	USN:	4AL17EC055
Topic:	Fixing Programming Errors Application 3:Built a website Blocker	Semester & Section:	6 TH SEM "A" SEC

AFTERNOON SESSION DETAILS

Image of session

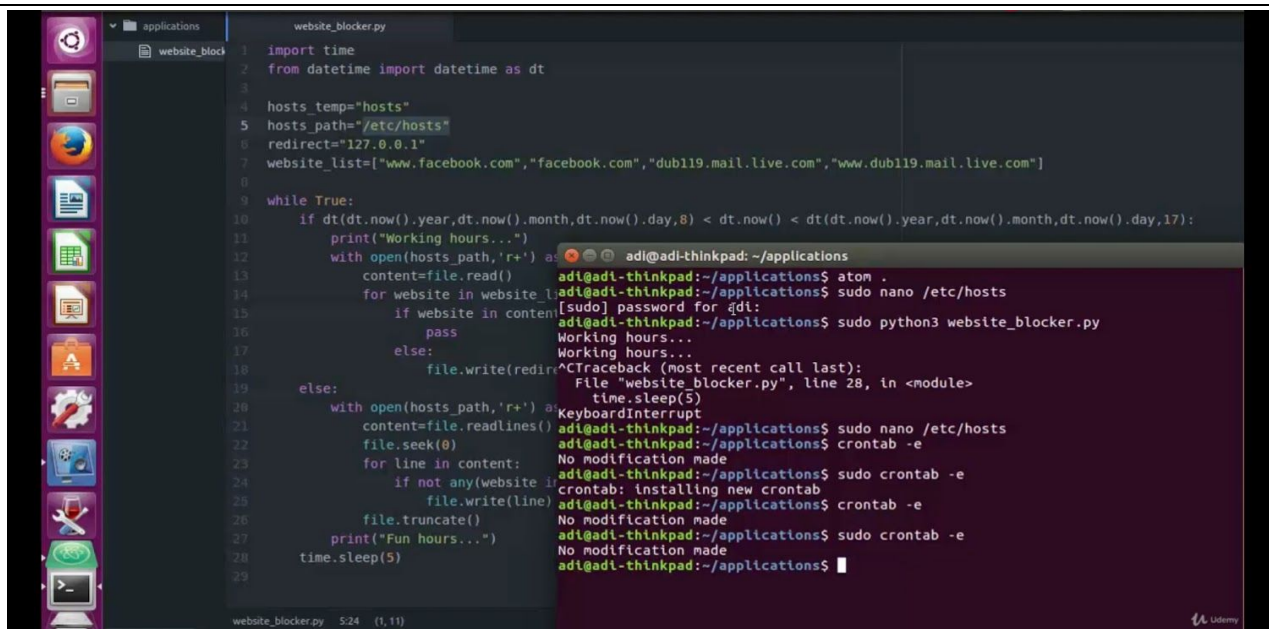


ectures More

- 40 ☒ Chromoprotein map
Video - 09:34 mins
- 41 ☒ Layer Control Panel
Video - 06:23 mins
- Section 18 - Fixing Programming Errors
- 42 ☒ Syntax Errors
Video - 08:22 mins
- 43 ☒ Runtime Errors
Video - 10:58 mins
- Errors
Quiz - 4 questions
- 44 ☒ How to Fix Difficult Errors
Video - 05:38 mins
- 45 ☒ Good Programming Questions
Video - 05:59 mins

Lectures More

- 150 Video - 11:00 mins
- 151 ☒ Implementing the First Part
Video - 12:16 mins
- 152 ☒ Implementing the Second Part
Video - 18:55 mins
- 153 The any() function
Article
- 154 ☒ Scheduling the Python Program o...
Video - 12:39 mins
- 155 ☒ Scheduling the Python Program o...
Video - 06:15 mins
- 156 Scheduling a Python Program on a Server
Article
- Section 20 - Application 4: Build a Personal Website wit...
- 157 Personal Website - How The Output ...



```
1 import time
2 from datetime import datetime as dt
3
4 hosts_path="/etc/hosts"
5 redirect="127.0.0.1"
6 website_list=["www.facebook.com","facebook.com","dub119.mail.live.com","www.dub119.mail.live.com"]
7
8 while True:
9     if dt(dt.now().year,dt.now().month,dt.now().day,8) < dt.now() < dt(dt.now().year,dt.now().month,dt.now().day,17):
10         print("Working hours...")
11         with open(hosts_path,'r+') as file:
12             content=file.read()
13             for website in website_list:
14                 if website in content:
15                     pass
16                 else:
17                     file.write(redirect+" "+website+"\n")
18             file.truncate()
19         print("Fun hours...")
20         time.sleep(5)
21     else:
22         with open(hosts_path,'r+') as file:
23             content=file.readlines()
24             file.seek(0)
25             for line in content:
26                 if not any(website in line for website in website_list):
27                     file.write(line)
28             file.truncate()
29         print("Fun hours...")
30         time.sleep(5)
```

adl@adl-thinkpad: ~/applications

adl@adl-thinkpad:~/applications\$ atom .

adl@adl-thinkpad:~/applications\$ sudo nano /etc/hosts

[sudo] password for adi:

adl@adl-thinkpad:~/applications\$ sudo python3 website_blocker.py

Working hours...

Working hours...

^CTraceback (most recent call last):

File "website_blocker.py", line 28, in <module>

time.sleep(5)

KeyboardInterrupt

adl@adl-thinkpad:~/applications\$ sudo nano /etc/hosts

adl@adl-thinkpad:~/applications\$ crontab -e

No modification made

adl@adl-thinkpad:~/applications\$ sudo crontab -e

crontab: installing new crontab

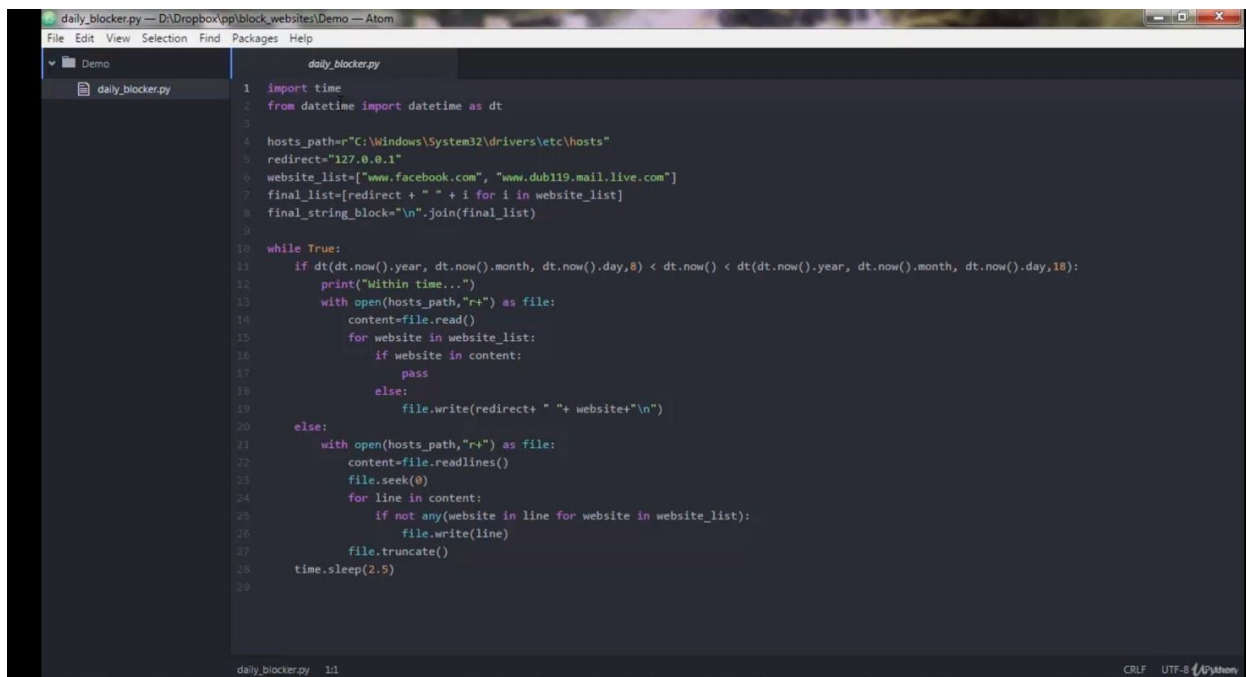
adl@adl-thinkpad:~/applications\$ crontab -e

No modification made

adl@adl-thinkpad:~/applications\$ sudo crontab -e

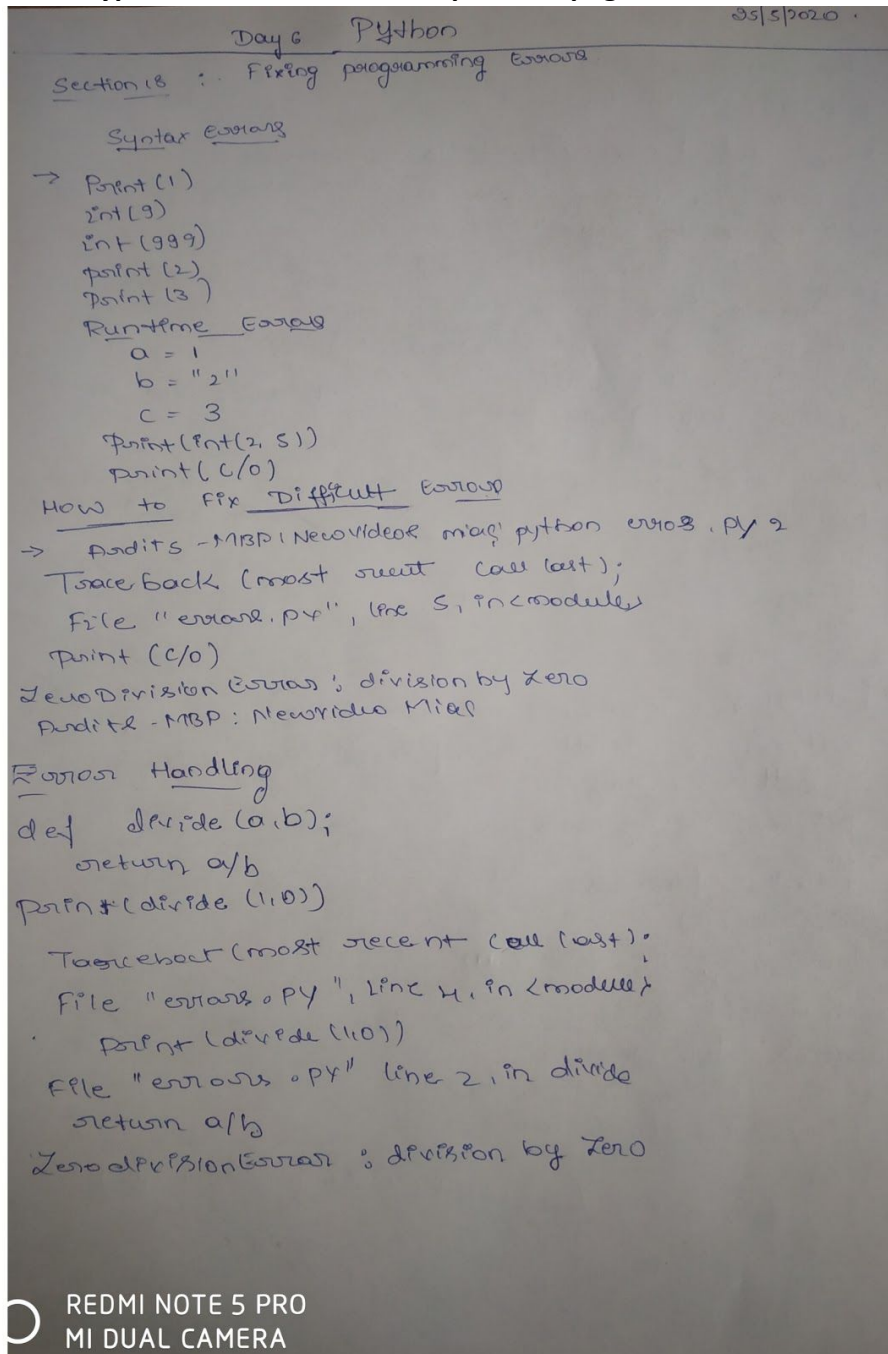
No modification made

adl@adl-thinkpad:~/applications\$



```
1 import time
2 from datetime import datetime as dt
3
4 hosts_path="C:\\Windows\\System32\\drivers\\etc\\hosts"
5 redirect="127.0.0.1"
6 website_list=["www.facebook.com", "www.dub119.mail.live.com"]
7 final_list=[redirect + " " + i for i in website_list]
8 final_string_block="\n".join(final_list)
9
10 while True:
11     if dt(dt.now().year, dt.now().month, dt.now().day,8) < dt.now() < dt(dt.now().year, dt.now().month, dt.now().day,18):
12         print("Within time...")
13         with open(hosts_path,"r+") as file:
14             content=file.read()
15             for website in website_list:
16                 if website in content:
17                     pass
18                 else:
19                     file.write(redirect+ " "+website+"\n")
20             file.truncate()
21         print("Within time...")
22         with open(hosts_path,"r+") as file:
23             content=file.readlines()
24             file.seek(0)
25             for line in content:
26                 if not any(website in line for website in website_list):
27                     file.write(line)
28             file.truncate()
29         print("Within time...")
30         time.sleep(2.5)
```

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



Section 19 : Application 3: Build a website blocker

Application architecture

Program Architecture

Mac and Linux : /etc/hosts

Windows : c:\windows\system32\drivers\etc

Setting up the script

host

import time

host-path = os.path.join(os.path.dirname(__file__), "hosts")

redirect = "127.0.0.1"

website-list = ["www.facebook.com", "facebook.com", "dailymail.co.uk", "live.com"]

while True:

print(1)

time.sleep(5)

Setting up the infinite loop

while True:

if dt.datetime.now().year, dt.datetime.now().month, dt.datetime.now().day, (8)

< dt.datetime.now().year, dt.datetime.now().month,

< dt.datetime.now().day, 16):

print("working hours...")

else

print("fun hours...")

time.sleep(5)

Implementing the first part

with open(host-path, 'a+') as file:

content = file.read()

for website in website-list:

if website in content:

pass

else: file.write(redirect + " " + website + "\n")

else

print("Fun hours...")

time.sleep(5)

