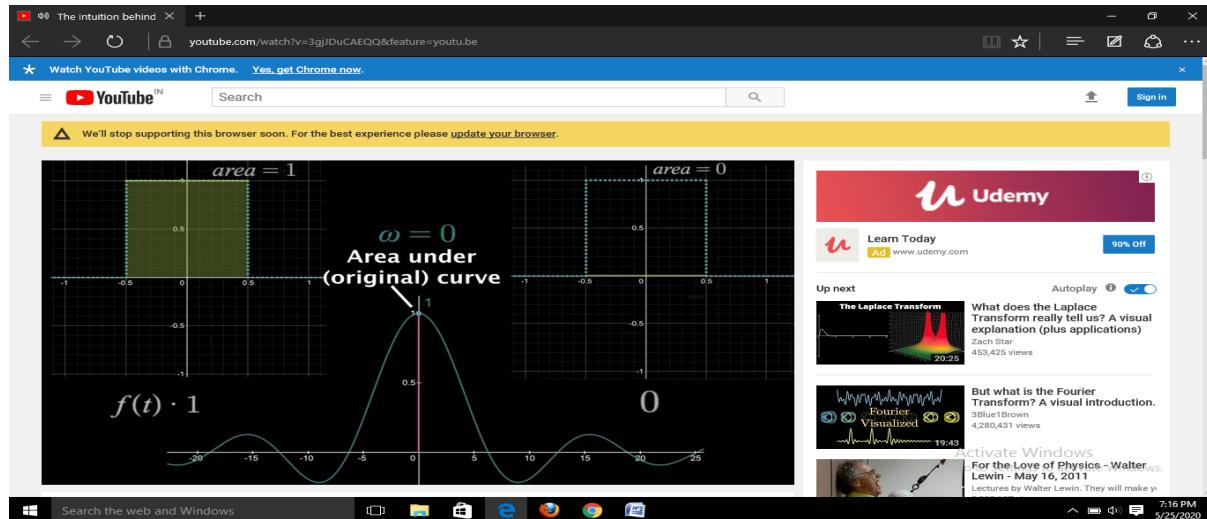
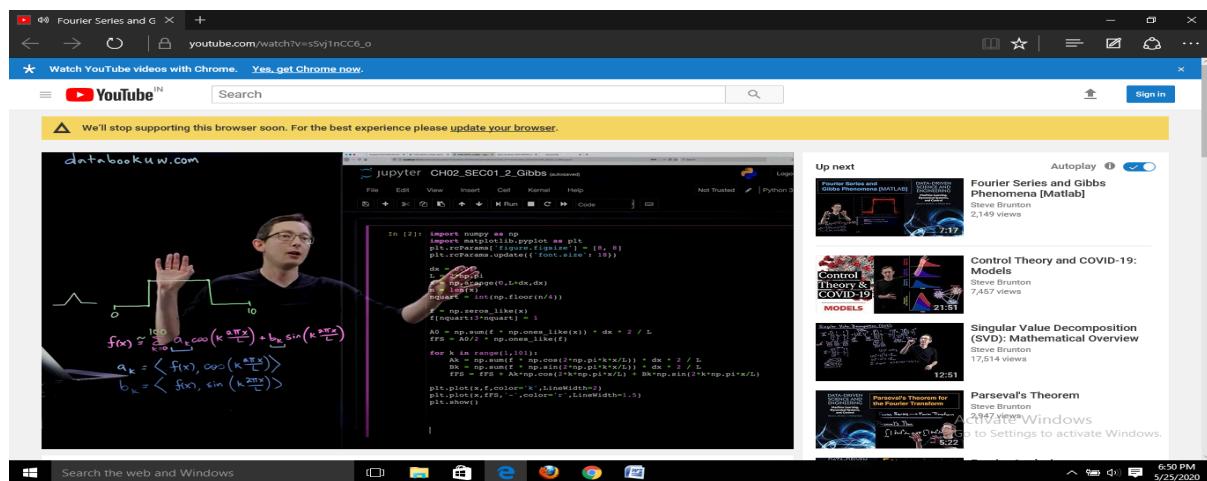
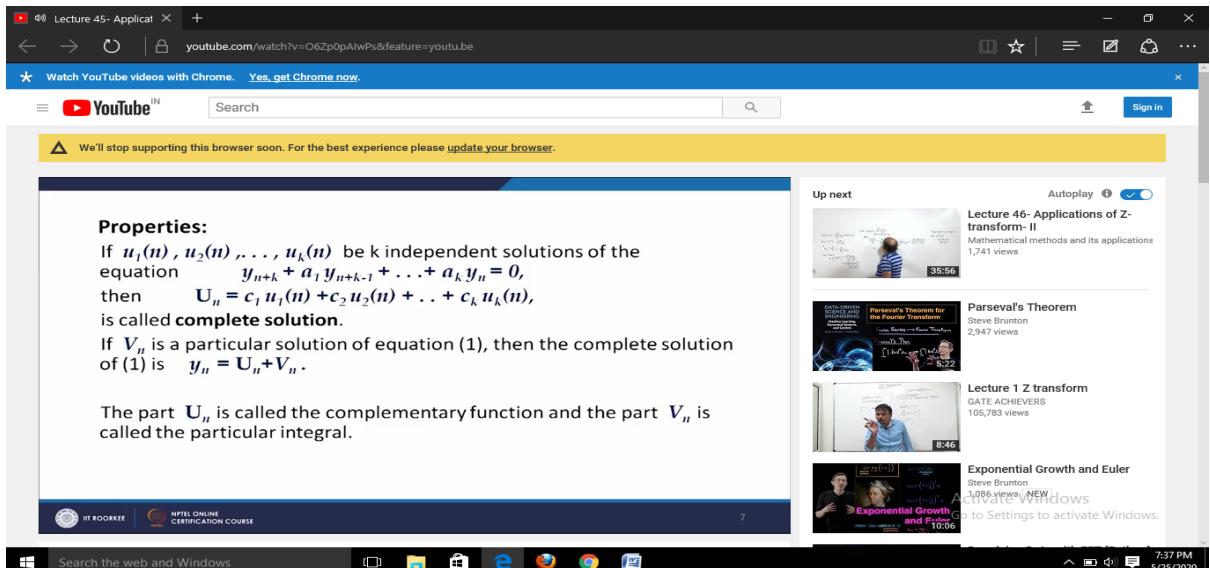
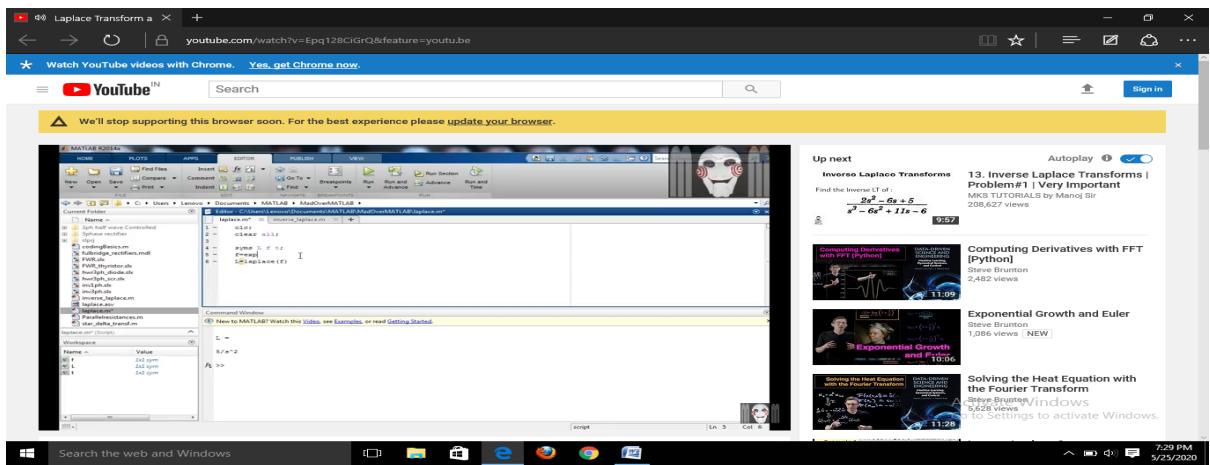
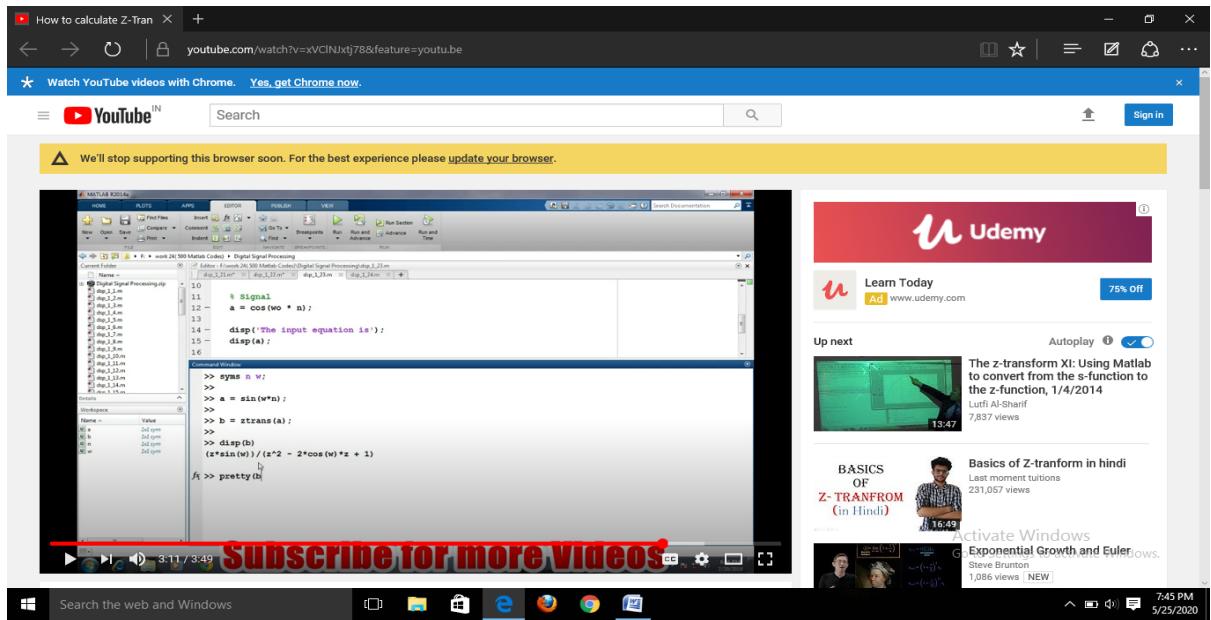


Date:	26-05-2020	Name:	Yamunashree N
Course:	Digital signal processing	USN:	4AL17EC097
Topic:	Fourier Series & Gibbs Phenomena using Python, Fourier Transform, Fourier Transform Derivatives, Fourier Transform and Convolution, Intuition of Fourier Transform and Laplace Transform, Laplace Transform of First order, Implementation of Laplace Transform using Matlab, Applications of Z-Transform, Find the Z-Transform of sequence using Matlab.	Semester and section	6 <sup>th</sup> sem 'B' section
Github repository:	yamunashree-courses		







26/05/2020

## Digital Signal processing

Day-2

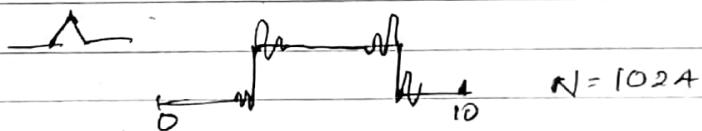
### \* Fourier Series and Gibbs Phenomena using Python

$$f(x) \cong \sum_{k=0}^{100} a_k \cos\left(k \frac{2\pi x}{L}\right) + b_k$$

$$\sin\left(k \frac{2\pi x}{L}\right)$$

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

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



### \* Fourier Transform

Fourier Series  $\rightarrow$  Fourier Transform

$$f(x) = \sum_{k=-\infty}^{\infty} c_k e^{ik\pi x/L}$$



$$c_k = \frac{1}{2L} \langle f(x), \psi_k \rangle = \frac{1}{2L} \int_{-L}^L f(x) \underbrace{e^{-ik\pi x/L}}_{\psi_k} dx$$

$$f(x) = \lim_{\Delta\omega \rightarrow 0} \sum_{k=-\infty}^{\infty} \frac{\Delta\omega}{2\pi} \int_{-\pi/\Delta\omega}^{\pi/\Delta\omega} f(\xi) e^{-ik\omega_x \xi} d\xi$$



Brilliant

$$= \int_{-\infty}^{\infty} \frac{1}{2\pi} \int_{-\infty}^{\infty} f(x) e^{-i\omega x} dx e^{i\omega x} dw$$

$$\hat{f}(w) = F(f(x)) = \int_{-\infty}^{\infty} f(x) e^{-i\omega x} dx$$

$$f(x) = F^{-1}(\hat{f}(w)) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \hat{f}(w) e^{i\omega x} dw$$

Fourier Transform Pair

### \* Fourier transform derivatives

$$\begin{aligned} F\left\{\frac{df}{dx} f(x)\right\} &= \int_{-\infty}^{\infty} \frac{df}{dx} e^{-i\omega x} dx \\ &= \underbrace{f(x) e^{-i\omega x}}_{uv=0} \Big|_{-\infty}^{\infty} - \int_{-\infty}^{\infty} \underbrace{f(x)}_v (-i\omega e^{-i\omega x}) dx \\ &= i\omega \int_{-\infty}^{\infty} f(x) e^{-i\omega x} dx \\ &= i\omega F(f(x)) \end{aligned}$$

$$F\left(\frac{df}{dx}\right)$$

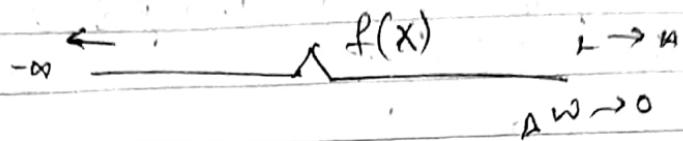
$$u_{tt} = c u_{xx} \Rightarrow \hat{u}_{tt} = -\omega^2 \hat{u}$$

(ODE)

$$u(x,t) \xrightarrow{F} \hat{u}(w,t)$$

### \* Fourier transform and convolution

$$(f * g) = \int_{-\infty}^{\infty} f(x-y) g(y) dy$$



$$\hat{f}(w) = \int_{-\infty}^{\infty} f(x) e^{-ixw} dx$$

$$f(x) = \int_{-\infty}^{\infty} \hat{f}(w) \frac{e^{inx}}{2\pi} dw$$

$$F(f * g) = F(f) F(g) = \hat{f} \hat{g}$$

$$f^{-1}(\hat{f} \hat{g})(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \hat{f}(w) \hat{g}(w) e^{iwx} dw$$

$$= \frac{1}{2\pi} \int_{-\infty}^{\infty} g(y) \underbrace{\int_{-\infty}^{\infty} \hat{f}(w) e^{i(w-x-y)} dw}_{\int_{-\infty}^{\infty} g(y) f(x-y) dy} dy$$

$$= f * g$$

\* Intuition of Fourier Transform and Laplace Transform

$$\text{Fourier : } F(w) = \int_{-\infty}^{\infty} f(t) e^{-iwt} dt$$

$$\text{Laplace : } F(s) = \int_0^{\infty} f(t) e^{-(s+is)t} dt$$

$$F(s) = \int_0^{\infty} f(t) e^{-ist} e^{-at} dt$$

\* Laplace Transform of First Order

Laplace Transform: 1<sup>st</sup> order equation

The transform of  $f(t)$  and  $y(t)$  are  $F(s)$  and  $\bar{y}(s)$ .

Definition: 
$$F(s) = \int_0^\infty f(t) e^{-st} dt$$

$$F(s) = \int_0^\infty e^{at} e^{-st} dt$$

$$= \left[ \frac{e^{(a-s)t}}{a-s} \right]_0^{\infty} = \frac{1}{s-a}$$

$$\frac{dy}{dt} = ay = 0 \quad \xrightarrow{LT} \int_0^\infty \frac{dy}{dt} e^{-st} dt$$

$$= \int_0^\infty y(t) (-sbe^{-st} dt) + [y e^{-st}]_0^\infty$$

Transform of  $\frac{dy}{dt}$  =  $s \bar{y}(s) - y(0)$

$$\bar{y}(s) = \frac{y(0)}{s-a} \xrightarrow{Shrinking LT} [y(t) = y(0)e^{at}]$$

\* Implementation of Laplace Transform using Matlab

using Software.

\* Applications of Z-Transform

$$Af(x) = f(x+h) - f(x)$$

$$\Delta y_{n+1} = y_{n+2} - y_{n+1}$$

stage  
Date \_\_\_\_\_  
Page \_\_\_\_\_

& hence

$$\Delta y_{n+1} + y_n = 2$$

Now

$$\Delta y_{n+1} = y_n - y_{n-1}$$

$$\Rightarrow y_{n+2} - y_{n+1} + y_n = 2 \quad & F$$

$$\Delta(\Delta y_{n+1}) = \Delta(y_n - y_{n-1})$$

$$\Delta y_{n+1} + \Delta^2 y_{n+1} = 1$$

$$y_{n+2} - y_{n+1} + \Delta(\Delta y_{n+1}) = \Delta y_n - \Delta y_{n-1}$$

$$= y_{n+1} - y_n -$$

$$(y_n - y_{n-1})$$

$$= y_{n+1} - 2y_n$$

Linear difference equations: it is defined as an equation in which  $y_{n+1}$ ,  $y_{n+2}$ , etc occur to the first degree only and separately.

If it is of the form

$$y_{n+k} + a_1 y_{n+k-1} + a_2 y_{n+k-2} + \dots + a_k y_n = f(n) \quad \text{--- (1)}$$

where  $a_1, a_2, \dots, a_k$  are constants

$$4y_{n+2} + 4y_{n+1} + 3y_n = 3^n, \quad u_0 = 0, \quad u_1 = 1$$

$$2(u_{n+2}) + 4u_{n+1} + 3u_n = 2(3^n)$$

$$(3^2 + 4 + 3) u(z) = \frac{2}{z-3} + z = \frac{2^2 - 2z}{z-3}$$

$$\text{Then } \frac{U(z)}{z} = \frac{(z-2)}{(z-3)(z+1)} = \frac{A}{z-3} + \frac{B}{z+1} + \frac{C}{z}$$

$$A = \frac{(z-2)}{(z+1)(z+3)} \Big|_{z=3} = \frac{1}{24}$$

$$B = \frac{(z-2)}{(z-3)(z+3)} \Big|_{z=-1} = \frac{-3}{(-4)(2)} = \frac{3}{8}$$

$$C = \frac{(z-2)}{(z-3)(z+1)} \Big|_{z=-3} = \frac{5}{12}$$

\* Find Z transform of Sequence  
using matlab

Date:	26-05-2020	Name:	Yamunashree N
Course:	Python programming	USN:	4AL17EC097
Topic:	Application 4: Build a personal website with python and flask.	Semester and section:	6 <sup>th</sup> sem and B sec

The screenshot shows a Windows desktop environment. In the center, a browser window displays a simple Flask application with the URL `http://127.0.0.1:5000/about`. The page content is "Website content goes here!". To the left of the browser, a terminal window titled "script1.py" shows the Python code for the Flask application. Below the terminal, the command prompt shows the application running and responding to a GET request. On the right side of the screen, there is a system tray icon for "Activate Windows".

```
1 from flask import Flask
2
3 app=Flask(__name__)
4
5 @app.route('/')
6 def home():
7     return "Homepage here!"
8
9 @app.route('/about')
10 def home():
11     return "Website content goes here!"
12
13 if __name__ == "__main__":
14     app.run()
15
16
17 127.0.0.1 - - [13/Dec/2015 22:35:37] "GET /about HTTP/1.1" 200 -
18 127.0.0.1 - - [13/Dec/2015 22:35:37] "GET /about/ HTTP/1.1" 200 -
* Detected change in 'C:\pp\Demo\d_flask_website\Demo\script1.py', reloading
* Restarting with stat
[restarting...]
Traceback (most recent call last):
  File "script1.py", line 9, in <module>
    @app.route('/about')
  File "C:\Users\ladi\AppData\Local\Programs\Python\Python35\lib\site-packages\flask\app.py", line 1013, in decorator
    self.add_url_rule(rule, endpoint, f, **options)
  File "C:\Users\ladi\AppData\Local\Programs\Python\Python35\lib\site-packages\flask\app.py", line 62, in wrapper_func
    return f(self, *args, **kwargs)
  File "C:\Users\ladi\AppData\Local\Programs\Python\Python35\lib\site-packages\flask\app.py", line 984, in add_url_rule
    'existing endpoint function: %s' % endpoint)
AssertionError: View function mapping is overwriting an existing endpoint function: home
PS C:\pp\Demo\d_flask_website\Demo>
```

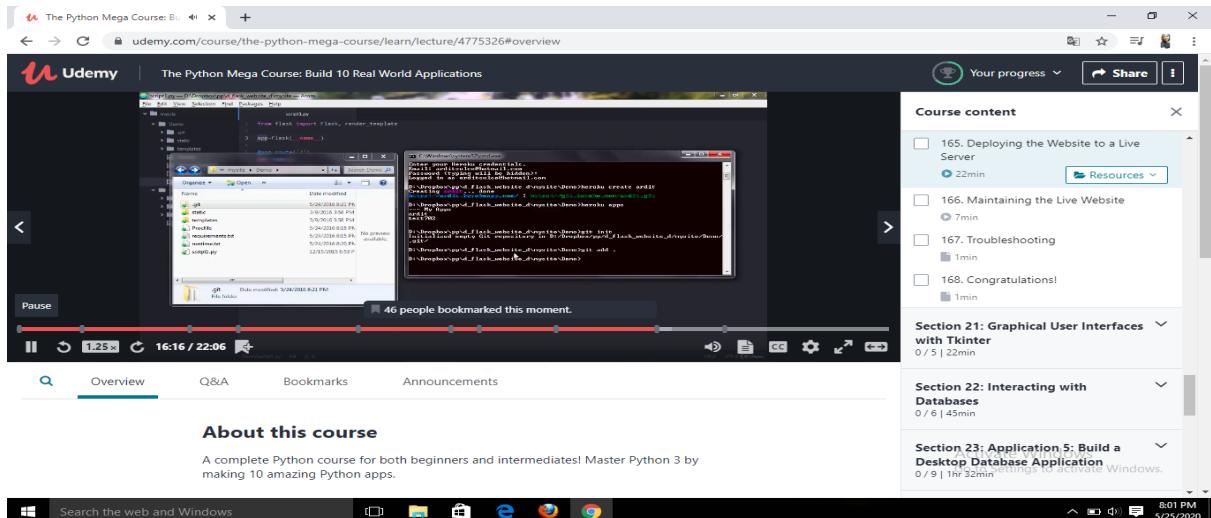
The screenshot shows a code editor with multiple tabs open. The left sidebar lists files: Demo, static, css, templates, about.html, layout.html, layout.html, main.css, home.html, script.py. The main area has two panes. The left pane contains the content of 'script.py':

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>Flask App</title>
5     <link rel="stylesheet" href="{{ url_for('static', filename='css/main.css') }}"/>
6   </head>
7   <body>
8     <header>
9       <div class="container">
10         <h1 class="logo">Ardit's web app</h1>
11         <strong><nav>
12           <ul class="menu">
13             <li><a href="{{ url_for('home') }}>Home</a></li>
14             <li><a href="{{ url_for('about') }}>About</a></li>
15           </ul>
16         </nav></strong>
17       </div>
18     </header>
19     <div class="container">
20       <block content%>
21       </block content%>
22     </div>
23   </body>
24 </html>
```

The right pane contains the content of 'main.css':

```
1 body {
2   margin: 0;
3   padding: 0;
4   font-family: "Helvetica Neue", Helvetica, Arial, sans-serif;
5   color: #444;
6 }
7 /*
8  * Formatting the header area
9 */
10 header {
11   background-color: #DFB887;
12   height: 35px;
13   width: 100%;
14   opacity: .9;
15   margin-bottom: 10px;
16 }
17 header h1.logo {
18   margin: 0;
19   font-size: 1.7em;
20   color: #FFF;
21   text-transform: uppercase;
22   float: left;
23 }
24 header h1.logo:hover {
```

At the bottom, there is a status bar with file names (script.py, layout.html, layout.html, main.css, home.html), a progress bar (1.25%), and a message: "Activate Windows Go to Settings to activate Windows."



## Troubleshooting

If you deployed your website on Heroku but when you visit the website on the browser you see an error, you probably did something wrong during the deployment.

No worries! You can see what you did wrong by looking at the server logs. You can access the server logs by running the following in your terminal:

```
heroku logs
```

This command will show a series of messages. Carefully read the logs to understand what went wrong. If you have trouble understanding the logs, feel free to post the logs in the Q&A.

Activate Windows  
Go to Settings to activate Windows.



26/05/2020  
Day - 7

## Application 4: Build a personal website with Python and Flask

- \* Personal website - How the output will look like
- \* your first website
- \* HTML templates
- \* Navigation menu
- \* Note on Browser caching
- \* How to install Git
- \* Deploying the website to a live server
- \* Maintaining the live website
- \* Troubleshooting
- ~~\* [https://www.computerhope.com](#)~~