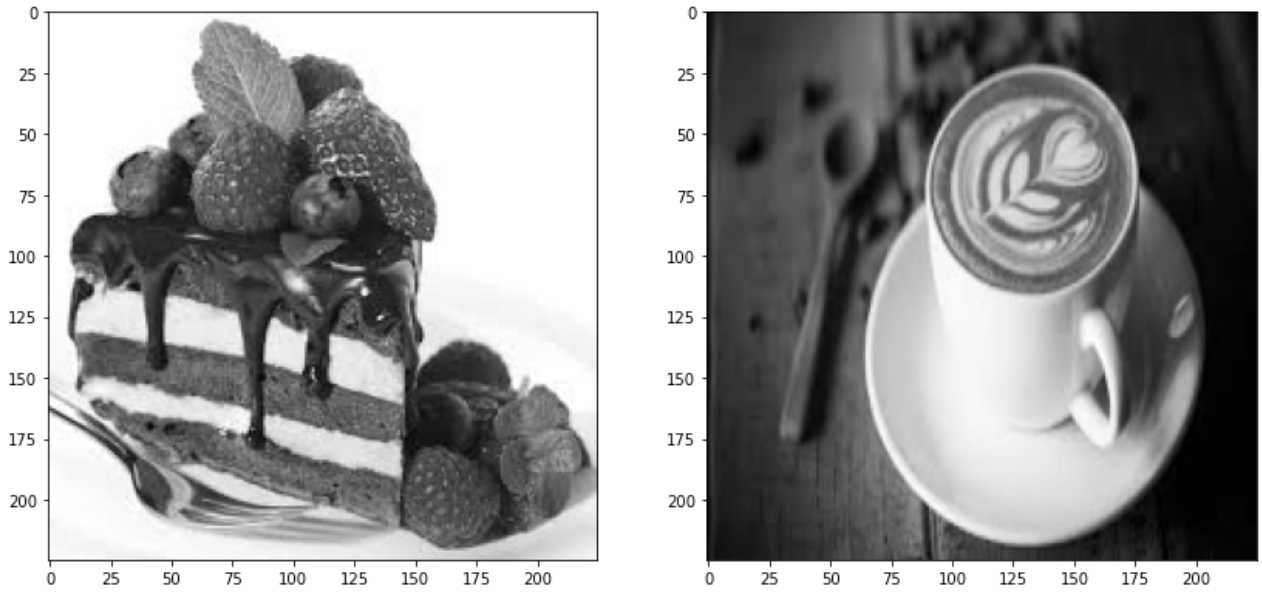
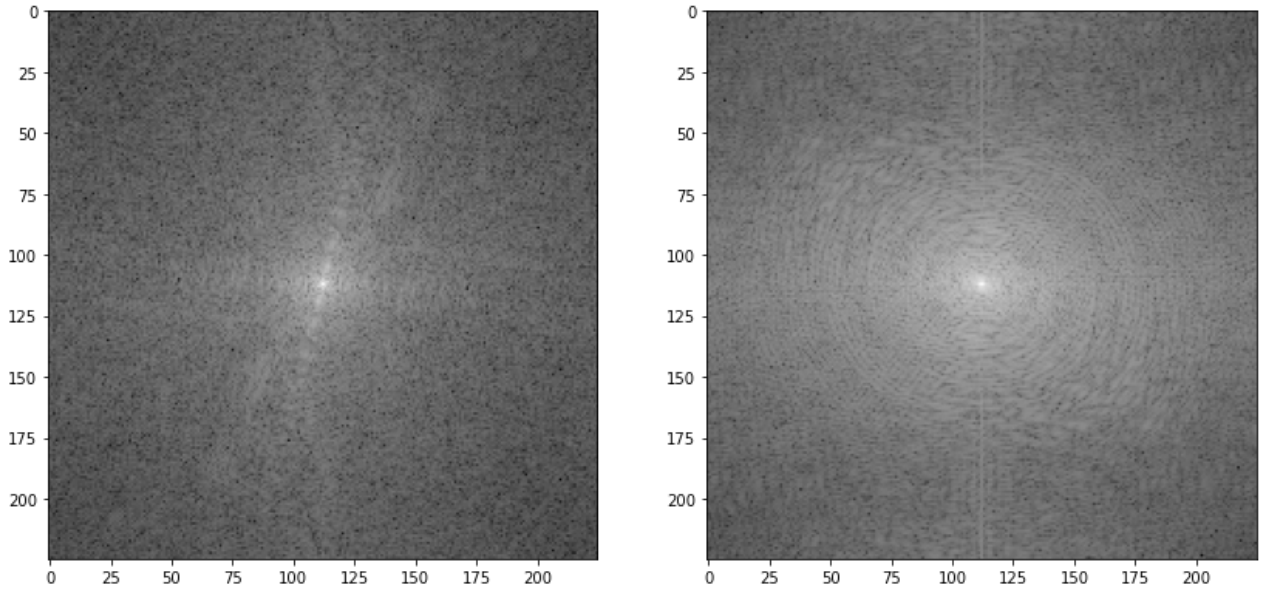
https://iust-projects.ir/post/cv02/

In [2]:
```
import cv2
import numpy as np
import matplotlib.pyplot as plt

%matplotlib inline
```

In [18]:
```
desert = cv2.imread('dessert1.jpg', 0)
coffee = cv2.imread('coffee.jpg', 0)
a,b=desert.shape
coffee=cv2.resize(coffee,(b,a))
plt.figure(figsize=(14, 18))
plt.subplot(121)
plt.imshow(desert, cmap='gray')
plt.subplot(122)
plt.imshow(coffee, cmap='gray')
plt.show()
```

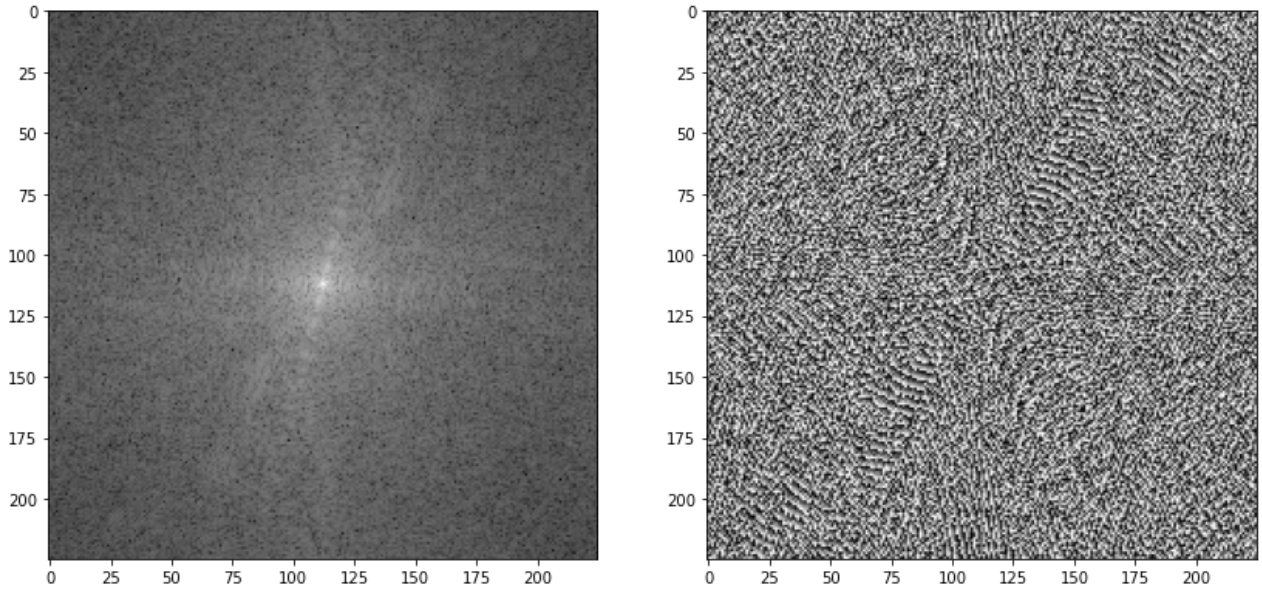


In [19]:
```
desert_fft = np.fft.fftshift(np.fft.fft2(desert))
coffee_fft = np.fft.fftshift(np.fft.fft2(coffee))

plt.figure(figsize=(14, 18))
plt.subplot(121)
plt.imshow(np.log(np.abs(desert_fft)), cmap='gray')
plt.subplot(122)
plt.imshow(np.log(np.abs(coffee_fft)), cmap='gray')
plt.show()
```



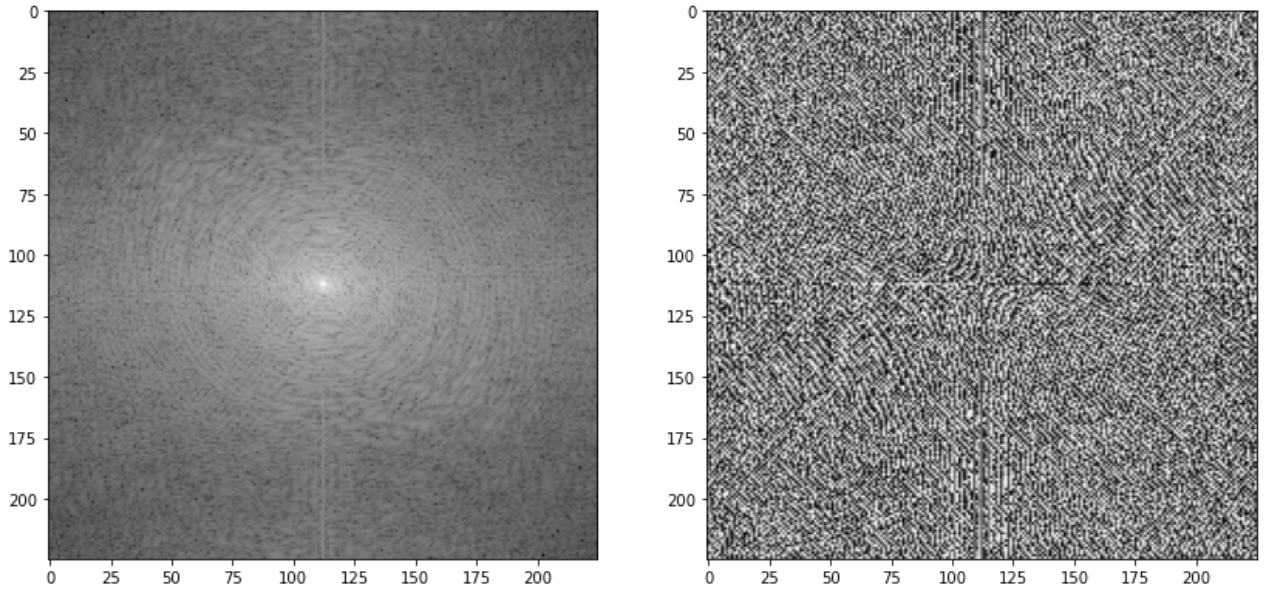
In [20]:
```
desert_amplitude = np.sqrt(np.real(desert_fft) ** 2 + np.imag(desert_fft) ** 2)
desert_phase = np.arctan2(np.imag(desert_fft), np.real(desert_fft))
coffee_amplitude = np.sqrt(np.real(coffee_fft) ** 2 + np.imag(coffee_fft) ** 2)
coffee_phase = np.arctan2(np.imag(coffee_fft), np.real(coffee_fft))
plt.figure(figsize=(14, 18))
plt.subplot(121)
plt.imshow(np.log(desert_amplitude+1e-10), cmap='gray')
plt.subplot(122)
plt.imshow(desert_phase, cmap='gray')
```

Out[20]: <matplotlib.image.AxesImage at 0x2426f37e910>



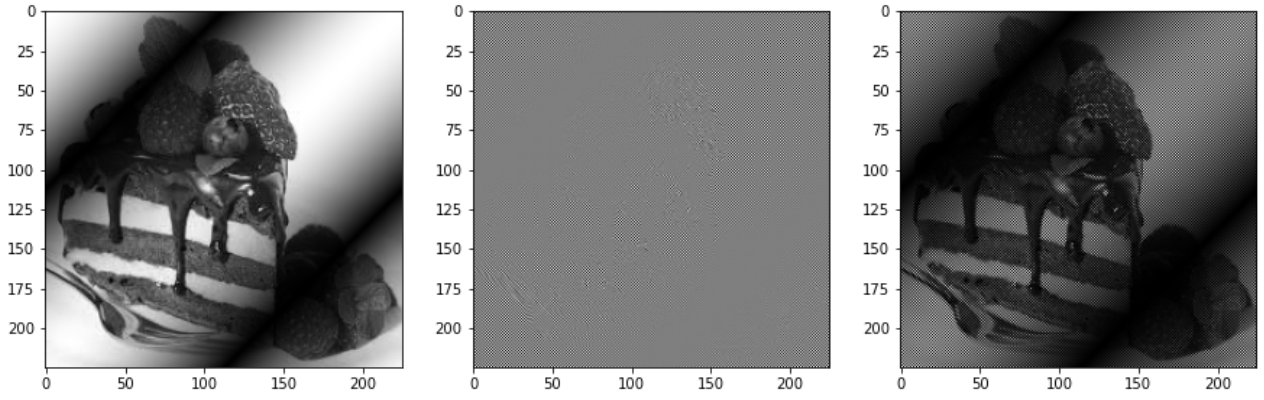
In [21]:
```
plt.figure(figsize=(14, 18))
plt.subplot(121)
plt.imshow(np.log(coffee_amplitude+1e-10), cmap='gray')
plt.subplot(122)
plt.imshow(coffee_phase, cmap='gray')
```

Out[21]: <matplotlib.image.AxesImage at 0x24200f43d60>



In [22]:
```
desert_coffee_comb = np.multiply(desert_amplitude, np.exp(1j * desert_phase))
desert_coffee = np.real(np.fft.ifft2(desert_coffee_comb))  # drop imagniary as they are

# combined image has values < 0 and > 1, needs to be scaled.
plt.figure(figsize=(15, 20))
plt.subplot(131)
plt.imshow(np.abs(desert_coffee), cmap='gray')
plt.subplot(132)
desert_coffee_shift = desert_coffee + desert_coffee.min()
desert_coffee_shift[desert_coffee_shift>255] = 255
plt.imshow(desert_coffee_shift, cmap='gray')
plt.subplot(133)
desert_coffee[desert_coffee>255] = 255
desert_coffee[desert_coffee <0] = 0
plt.imshow(desert_coffee, cmap='gray')
```

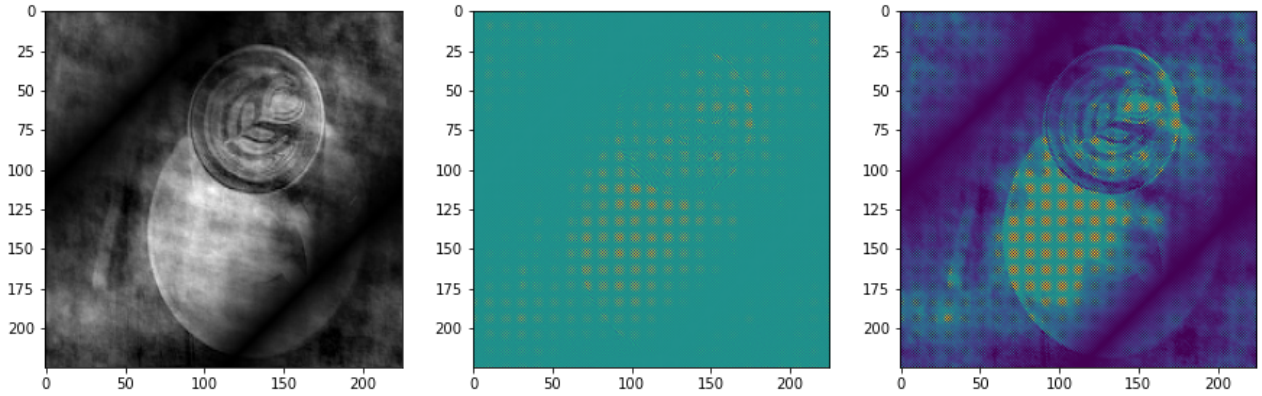
Out[22]:
```
<matplotlib.image.AxesImage at 0x24200d81580>
```



In [23]:
```
# amplitude_phase
desert_coffee_comb = np.multiply(desert_amplitude, np.exp(1j * coffee_phase))
desert_coffee = np.real(np.fft.ifft2(desert_coffee_comb))  # drop imagniary as they are

# combined image has values < 0 and > 1, needs to be scaled.
plt.figure(figsize=(15, 20))
plt.subplot(131)
plt.imshow(np.abs(desert_coffee), cmap='gray')
plt.subplot(132)
```

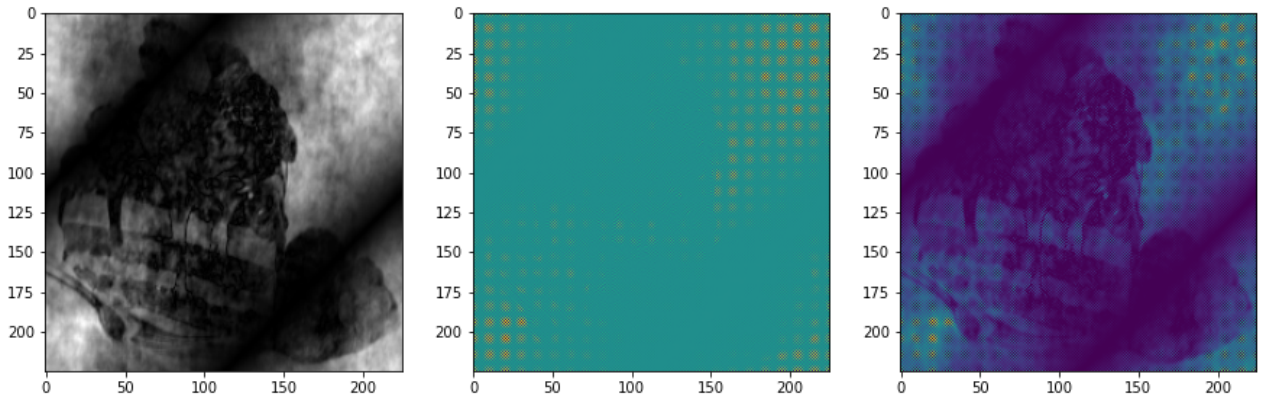
```
desert_coffee_shift = desert_coffee + desert_coffee.min()
desert_coffee_shift[desert_coffee_shift>255] = 255
plt.imshow(desert_coffee_shift)
plt.subplot(133)
desert_coffee[desert_coffee>255] = 255
desert_coffee[desert_coffee <0] = 0
plt.imshow(desert_coffee)
```

Out[23]: <matplotlib.image.AxesImage at 0x24200e7c280>



In [24]:
```
# amplitude_phase
coffee_desert_comb = np.multiply(coffee_amplitude, np.exp(1j * desert_phase))
coffee_desert = np.real(np.fft.ifft2(coffee_desert_comb))  # drop imagniary as they are

# combined image has values < 0 and > 1, needs to be scaled.
plt.figure(figsize=(15, 20))
plt.subplot(131)
plt.imshow(np.abs(coffee_desert), cmap='gray')
plt.subplot(132)
coffee_desert_shift = coffee_desert + coffee_desert.min()
coffee_desert_shift[coffee_desert_shift>255] = 255
plt.imshow(coffee_desert_shift)
plt.subplot(133)
coffee_desert[coffee_desert>255] = 255
coffee_desert[coffee_desert <0] = 0
plt.imshow(coffee_desert)
```

Out[24]: <matplotlib.image.AxesImage at 0x24200fb8040>



In [ ]: