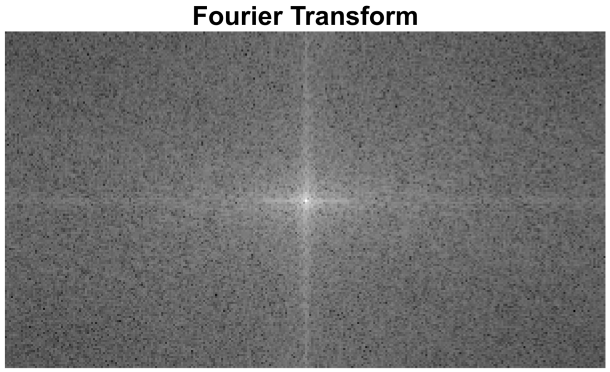
Question 4: Fourier Transform and Filters

Code:

```
% Load the image
image = imread('Nature.jpeg');
gray_image = rgb2gray(image);

% Apply Fourier Transform
fft_image = fftshift(fft2(gray_image));
figure, imshow(log(1 + abs(fft_image)), []), title('Fourier Transform');
```




```
% Apply Butterworth Filter
D0 = 30; % Cut-off frequency
n = 2; % Order of filter
butterworth_filter = 1 ./ (1 + (fft_image / D0).^(2*n));
butterworth_filtered = fft_image .* butterworth_filter;
figure, imshow(log(1 + abs(butterworth_filtered)), []), title('Butterworth Filter');
```


```
% Apply Gaussian Filter
```

```
sigma = 10;
gaussian_filter = fspecial('gaussian', size(gray_image), sigma);
gaussian_filtered = ifft2(ifftshift(fft_image .* gaussian_filter));
figure, imshow(abs(gaussian_filtered), []), title('Gaussian Filtered Image');
```