

ME244: Homework 1

Released on Feb 14, 2019

Submission date: February 26th, 10:00 am

1. Find the Fourier transforms of the following functions

(a) Gaussian function

$$f(x) = Ce^{-ax^2}$$

(b) The cylinder function:

$$f(x, y) = \begin{cases} 1 & \sqrt{x^2 + y^2} \leq a \\ 0 & \sqrt{x^2 + y^2} > a \end{cases}$$

(Try using polar co-ordinates for (b))

2. Download the image set for Homework 1. There are 20 images in the zip folder. You are required to write a code to analyse the images and then provide the final code and the output as a response.

(a) For the first image find out the value of the brightest pixel. Also, find out the average pixel value of the background.

(b) What is the approximate radius of the particle? How will you estimate that?

(c) Write a code to estimate the particle centres for all the images. Provide the code and the values as a matrix. Estimate the particle centres to sub-pixel accuracy.

(d) Plot histograms for the x -direction & y -direction displacements of the particle.