Code:

import numpy as np

import matplotlib.pyplot as plt

def sineSeries(t, omega, N):

    #The Equation

    result = np.zeros\_like(t)

    for n in range(1, 2\*N, 2):

        result += (1 / n\*\*2) \* np.cos(n \* omega \* t)

    return (8 / np.pi\*\*2) \* result

def plot\_sineSeries():

    N = int(input("Enter the number of sine terms in the series (N): "))

    omega = 2 \* np.pi

    sample\_rate = 48000

    duration = 1

    t = np.linspace(0, duration, int(sample\_rate \* duration))

    y = sineSeries(t, omega, N)

    #Plotting

    plt.figure(figsize=(10, 6))

    plt.plot(t, y, label=f"Sine series with N = {N} terms")

    plt.title(r"$y(t) = \frac{8}{\pi^2} \left( \cos(\omega t) + \frac{1}{9} \cos(3\omega t) + \dots + \frac{1}{N^2} \cos(N\omega t) \right)$")

    plt.xlabel("Time (t)")

    plt.ylabel("Amplitude")

    plt.grid(True)

    plt.legend()

    #Show

    plt.show()

plot\_sineSeries()