PHYS 381 – Computational Physics I (Winter 2025)

Assignment #4: Fourier analysis using Python

Due date: March 31, 2025

**Group members:**

Member #1: Jared Crebo (30085839)

**Authors’ contributions:**

This assignment was completed solo. All work presented in this document and the related code was completed by Jared Crebo.

**Abstract (0.5 points):**

**Introduction (0.5 points):**

The Fourier analysis is very relevant for signal processing. It can decompose both period and non-periodic signals into constituent harmonic vibrations. First looking at periodic functions, any periodic function can be represented as a Fourier series:

The frequency is the fundamental frequency, and every other is harmonic. The Fourier coefficients and amplify certain harmonic functions depending on their values. Functions can be reconstructed in this format as an infinite sum of this Fourier series. However, in practical use it is summed over *N* Fourier coefficients.

For non-period functions, a Fourier transform is carried out to integrate the series over a continuous range of frequencies.

**Methods (1 point):**

**Code workflow (1 point):**

**Results and analysis (1 point):**

**Conclusions (0.5 points):**

**References:**

[1] PHYS 381 Assignment 4: Fourier analysis in Python, *PHYS 381: Computational Physics I,* Department of Physics and Astronomy, University of Calgary, Winter 2025

**Other (0.5 points):**

This page is to be filled by the instructor or TAs ONLY.

Remaining 0.5 points are granted for following the template and overall quality of the report.

Was the assignment submitted before the due date (mark one option)? YES NO