

Unit 4: Fourier Transform

Contents

- Scope and Background Reading
- Contents

This chapter continues our coverage of **Fourier Analysis** with an introduction to the **Fourier Transform**.

- **Fourier Series** is used when we are dealing with signals that are *periodic* in time. It is based on harmonics of the fundamental frequency Ω_0 of the periodic signal where the period $T = 2\pi/\Omega_0$.
- The line spectrum occur at integer multiples of the fundamental frequency $k\omega_0$ and is a *discrete* (or sampled) function of frequency.
- As the period T is increased, the distance between harmonics decreases because Ω_0 reduces.
- In the limit $T \rightarrow \infty$, the signal becomes **aperiodic** and $k\Omega_0 \rightarrow \omega$ which is a *continuous* function of frequency.

This is the basis of the **Fourier Transform** which is very important as the basis for data transmission, signal filtering, and the determination of system frequency response.

Scope and Background Reading

The material in this presentation and notes is based on Chapter 8 (Starting at Section 8.1) of Karris [[Karris, 2012](#)]. I also used Chapter 5 of [[Boulet, 2006](#)] which unfortunately is no longer available as an e-book from the library.

Contents

In this section of the course we will cover:

[Unit 4.1: Defining the Fourier Transform](#) [4.2: Fourier transforms of commonly occurring signals](#) [Unit 4.3: Fourier Transforms for Circuit and LTI Systems Analysis](#)
[Introduction to Filters](#)

Previous

< [Unit 3.3: Line Spectra and their Applications](#)

Next

[Unit 4.1: Defining the Fourier Transform](#) >