

OVERVIEW

Linear systems and circuit applications

Discrete Time Systems

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Transformations for signal in **continuous time**

For Periodic signals

For non-periodic signals

Fourier Series (FS)

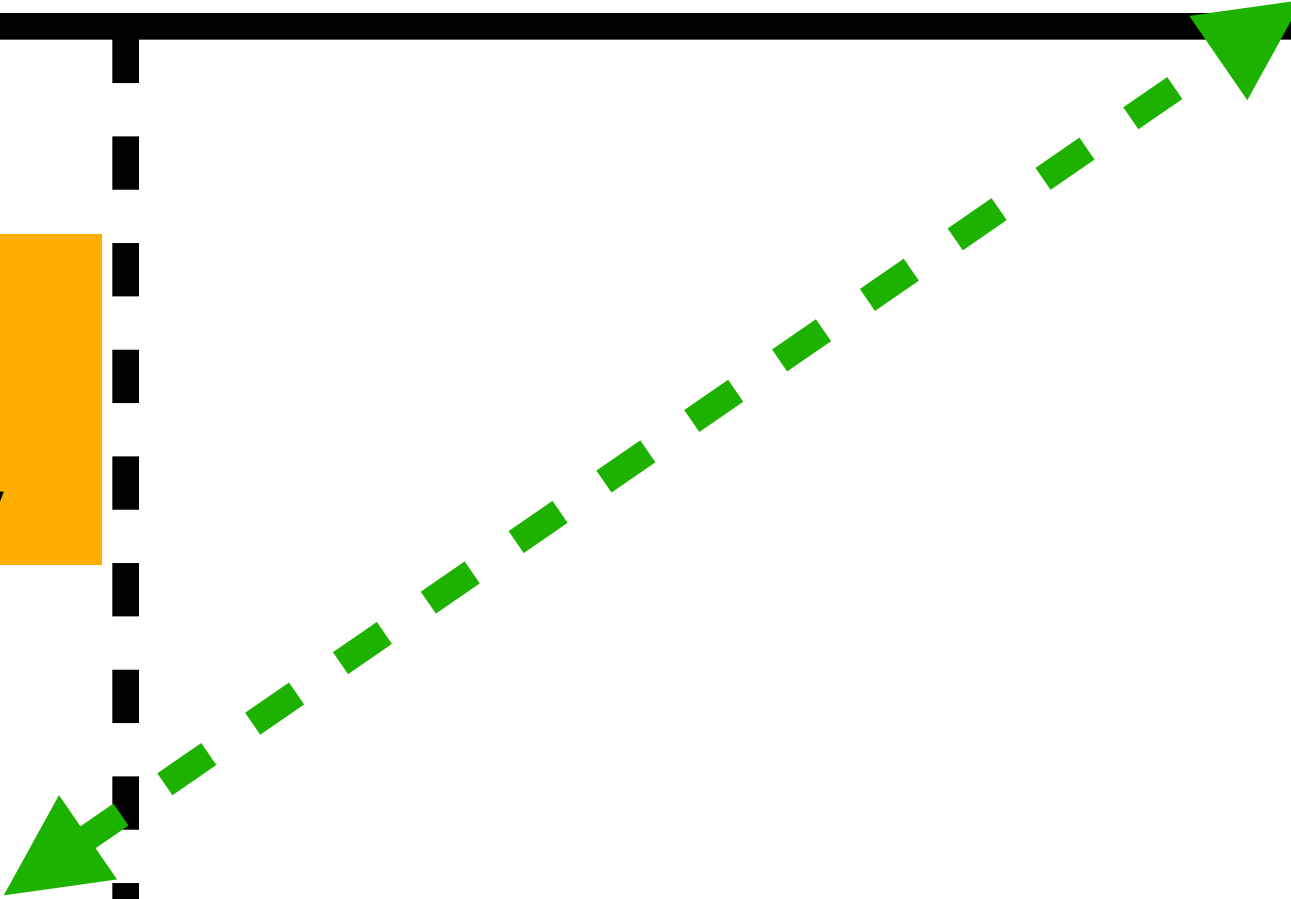
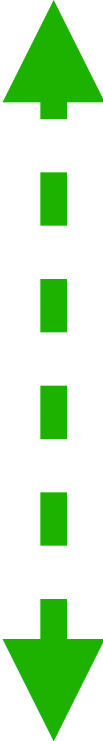
Stand. Fourier Transform (FT)

Laplace Transform (LT)

also for some
Signals with
Infinite Energy

Generalized
Fourier Transform
(GFT)

*Mathematically, it is not
completely valid... or we need
other definition of Fourier
Transformation....*



Transformations for signal in **discrete time**

For Periodic signals

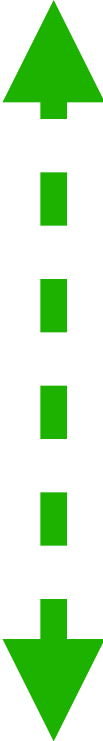
For non-periodic signals

Fourier Series (FS)

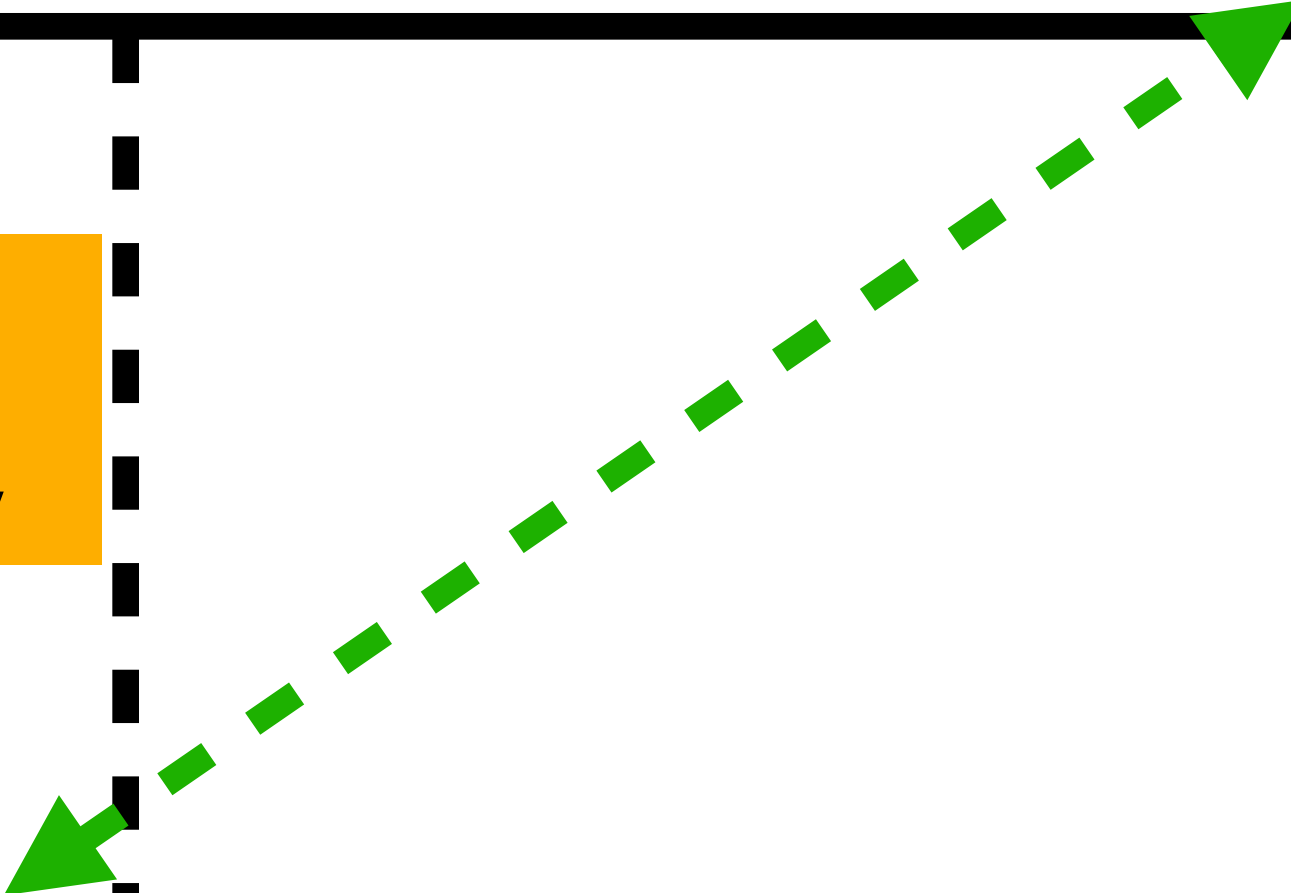
Stand. Fourier Transform (FT)

Zeta Transform (ZT)

also for some
Signals with
Infinite Energy



Generalized
Fourier Transform
(GFT)



*Mathematically, it is not
completely valid... or we need
other definition of Fourier
Transformation....*

Fourier series....

The existence of the Fourier series is the “proof” that the Standard Fourier transform (WITH OUR MATH) cannot be used for periodic signals...

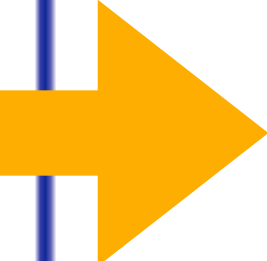
The LAPLACE AND ZETA TRANSFORMS generalize the Standard Fourier transform...

Transformations for signal in **discrete time**

MOREOVER: (practical tools...)

- **Discrete Fourier Transform (DFT)**
- **Fast Fourier Transform (FFT) ==> Fast version of DFT**

DFT “mathematically” very similar to (almost the same) Fourier Series for discrete time

	Periódica en el tiempo	No periódica en el tiempo	
Continua en el tiempo $\omega_0 = \frac{2\pi}{T}$	CTFS $a_k = X[k] = \frac{1}{T} \int_{\langle T \rangle} x(t) e^{-jk\omega_0 t} dt$ $x(t) = \sum_{k=-\infty}^{\infty} a_k e^{jk\omega_0 t}$	CTFT $x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(\omega) e^{j\omega t} d\omega$ $X(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt$	No periódica en frecuencia
WE WILL SEE:  (in this course) $\Omega_0 = \frac{2\pi}{N}$	DTFS $x[n] = \sum_{k=\langle N \rangle} a_k e^{jk\Omega_0 n}$ $a_k = X[k] = \frac{1}{N} \sum_{n=\langle N \rangle} x[n] e^{-jk\Omega_0 n}$	DTFT $x[n] = \frac{1}{2\pi} \int_{-\pi}^{\pi} X(\Omega) e^{j\Omega n} d\Omega$ $X(\Omega) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\Omega n}$	Periódica en frecuencia
	Discreta en frecuencia	Continua en frecuencia	
	FOURIER SERIES	STANDARD FOURIER TRANSFORM	

Questions?