SERIE TRIGONOMÉTRICA DE *FOURIER*:

$$f(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty}[a_n \cos(n\omega_0 t) + b_n \operatorname{sen}(n\omega_0 t)]$$

$$a_0 = \frac{2}{T}\int_0^T f(t)dt \qquad a_n = \frac{2}{T}\int_0^T f(t)\cos(n\omega_0 t)dt$$

$$b_n = \frac{2}{T}\int_0^T f(t)\operatorname{sen}(n\omega_0 t)dt$$

SERIE COMPLEJA DE *FOURIER*:

$$f(t) = \sum_{n=-\infty}^{\infty} c_n e^{jn\omega_0 t}$$

$$c_0 = \frac{1}{T}\int_0^T f(t)dt \qquad c_n = \frac{1}{T}\int_0^T f(t)e^{-jn\omega_0 t}dt$$

$$a_n = 2\,\mathbb{R}e\{c_n\}$$

$$b_n = -2\,\mathbb{I}m\{c_n\}$$

$$\cos(\theta) = \frac{e^{j\theta}+e^{-j\theta}}{2} \qquad \operatorname{sen}(\theta) = \frac{e^{j\theta}-e^{-j\theta}}{2j}$$

$$e^{j\theta} = \cos(\theta) + j\operatorname{sen}(\theta) \qquad e^{\pm j2\pi n} = 1$$

$$e^{-j\theta} = \cos(\theta) - j\operatorname{sen}(\theta) \qquad e^{\pm j\pi} = -1$$

$$e^{\pm j\pi n} = \cos(\pi n)$$

FORMULAS ÚTILES:

$$\operatorname{sen}(\pi n) = 0;\quad n\in\mathbb{N} \qquad \cos(\pi n) = (-1)^n;\quad n\in\mathbb{N}$$

$$\operatorname{sen}(2\pi n) = 0;\quad n\in\mathbb{N} \qquad \cos(2\pi n) = 1;\quad n\in\mathbb{N}$$

$$\int \operatorname{sen}(at)dt = -\frac{\cos(at)}{a} \qquad \int t\operatorname{sen}(at)dt = -\frac{t}{a}\cos(at) + \frac{1}{a^2}\operatorname{sen}(at)$$

$$\int \cos(at)dt = \frac{\operatorname{sen}(at)}{a} \qquad \int t\cos(at)dt = \frac{t}{a}\operatorname{sen}(at) + \frac{1}{a^2}\cos(at)$$

$$\int e^{at}dt = \frac{1}{a}e^{at} \qquad \int te^{at}dt = \frac{t}{a}e^{at} - \frac{1}{a^2}e^{at}$$

FUNCIÓN IMPULSO:

$$\int_{-\infty}^{\infty}\delta(t-t_0)dt = 1$$

$$\int_{-\infty}^{\infty}\phi(t)\delta(t-t_0)dt = \phi(t_0)$$

$$\int_{-\infty}^{\infty}\phi(t)\delta^{(n)}(t-t_0)dt = (-1)^n\phi^{(n)}(t_0)$$

$$\delta(at) = \frac{1}{|a|}\delta(t)$$

$$t^n\delta(t) = 0; n\in\mathbb{N}$$

$$u'(t-t_0) = \delta(t-t_0)$$

$$\phi(t)\delta(t) = \phi(0)\delta(t)$$

$$\delta(-t) = \delta(t)$$

SIMETRÍAS DE ONDA:

	a_0	a_n	b_n
PAR	$\frac{4}{T}\int_0^{T/2} f(t)dt$	$\frac{4}{T}\int_0^{T/2} f(t)\cos(n\omega_0 t)dt$	0
IMPAR	0	0	$\frac{4}{T}\int_0^{T/2} f(t)\operatorname{sen}(n\omega_0 t)dt$
S.M.O.	0	$\begin{cases}\text{p:} & a_n = 0\\ \text{i:} & a_n = \frac{4}{T}\int_0^{T/2} f(t)\cos(n\omega_0 t)dt\end{cases}$	$\begin{cases}\text{p:} & b_n = 0\\ \text{i:} & b_n = \frac{4}{T}\int_0^{T/2} f(t)\operatorname{sen}(n\omega_0 t)dt\end{cases}$
S.C.O. PAR	0	$\begin{cases}\text{p:} & a_n = 0\\ \text{i:} & a_n = \frac{8}{T}\int_0^{T/4} f(t)\cos(n\omega_0 t)dt\end{cases}$	0
S.C.O. IMPAR	0	0	$\begin{cases}\text{p:} & b_n = 0\\ \text{i:} & b_n = \frac{8}{T}\int_0^{T/4} f(t)\operatorname{sen}(n\omega_0 t)dt\end{cases}$

SERIE DE *FOURIER* POR DIFERENCIACIÓN:

$$c_n = c_n' + c_n'' + \cdots + c_n^{(k)}$$

$$\gamma_n' = \frac{1}{T}\int_0^T f'(t)e^{-jn\omega_0 t}dt \qquad \gamma_n'' = \frac{1}{T}\int_0^T f''(t)e^{-jn\omega_0 t}dt \qquad \gamma_n^{(n)} = \frac{1}{T}\int_0^T f^{(k)}(t)e^{-jn\omega_0 t}dt$$

$$c_n' = \frac{\gamma_n'}{jn\omega_0} \qquad c_n'' = \frac{\gamma_n''}{(jn\omega_0)^2} \qquad c_n^{(k)} = \frac{\gamma_n^{(k)}}{(jn\omega_0)^k}$$

TEOREMA DE LA MULTIPLICACIÓN:

$$\frac{1}{T}\int_0^T f_1(t)f_2(t)dt = \sum_{n=-\infty}^{\infty} c_1(n)c_2(-n) = \sum_{n=-\infty}^{\infty} c_1(-n)c_2(n)$$

TEOREMA DE *PARSEVAL*:

$$\frac{1}{T}\int_0^T f^2(t)dt = c_0^2 + \frac{1}{2}\sum_{n=1}^{\infty}(a_n^2 + b_n^2)$$