PDE's in Cartesian Co-ordinates: Summary

PDE	Domain	ICs/BCs	FORMULAE
$u_{tt} = c^2 u_{xx}$	$0 < x < L$	$u(x,0) = f(x)$	$u(x,t) = \sum_n \left[a_n \cos\left(\frac{n\pi c}{L}t\right) + b_n \sin\left(\frac{n\pi c}{L}t\right)\right] \sin\left(\frac{n\pi}{L}x\right)$
	$t > 0$	$u_t(x,0) = g(x)$	$a_n = \frac{2}{L}\int_0^L f(x)\sin\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
		$u(0,t) = u(L,t) = 0$	$b_n = \frac{L}{n\pi c}\frac{2}{L}\int_0^L g(x)\sin\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
		$u(x,0) = f(x)$	$u(x,t) = \frac{a_0 + b_0 t}{2} + \sum_n \left[a_n \cos\left(\frac{n\pi c}{L}t\right) + b_n \sin\left(\frac{n\pi c}{L}t\right)\right] \cos\left(\frac{n\pi}{L}x\right)$
		$u_t(x,0) = g(x)$	$a_n = \frac{2}{L}\int_0^L f(x)\cos\left(\frac{n\pi}{L}x\right)\,dx \quad n \geq 0$
		$u_x(0,t) = u_x(L,t) = 0$	$b_0 = \frac{2}{L}\int_0^L g(x)\,dx, \quad b_n = \frac{L}{n\pi c}\frac{2}{L}\int_0^L g(x)\cos\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
	$-L < x < L$	$u(x,0) = f(x)$	$u(x,t) = \frac{a_0 + b_0 t}{2} + \sum_n \left[a_n \cos\left(\frac{n\pi c}{L}t\right) + b_n \sin\left(\frac{n\pi c}{L}t\right)\right] \cos\left(\frac{n\pi}{L}x\right)$
	$t > 0$	$u_t(x,0) = g(x)$	$+\sum_n \left[c_n \cos\left(\frac{n\pi c}{L}t\right) + d_n \sin\left(\frac{n\pi c}{L}t\right)\right] \sin\left(\frac{n\pi}{L}x\right) +$
		$u(-L,t) = u(L,t)$	$a_n = \frac{1}{L}\int_{-L}^L f(x)\cos\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 0$
		$u_x(-L,t) = u_x(L,t)$	$c_n = \frac{1}{L}\int_{-L}^L f(x)\sin\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
			$b_0 = \frac{1}{L}\int_{-L}^L g(x)\,dx, \quad b_n = \frac{L}{n\pi c}\frac{1}{L}\int_{-L}^L g(x)\cos\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
			$d_n = \frac{L}{n\pi c}\frac{1}{L}\int_{-L}^L g(x)\sin\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
$u_t = \kappa u_{xx}$	$0 < x < L$	$u(x,0) = f(x)$	$u(x,t) = \sum_n \left\{a_n \exp\left[-\left(\frac{n\pi}{L}\right)^2 \kappa t\right]\right\} \sin\left(\frac{n\pi}{L}x\right)$
	$t > 0$	$u(0,t) = u(L,t) = 0$	$a_n = \frac{2}{L}\int_0^L f(x)\sin\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
		$u(x,0) = f(x)$	$u(x,t) = \frac{a_0}{2} + \sum_n \left\{a_n \exp\left[-\left(\frac{n\pi}{L}\right)^2 \kappa t\right]\right\} \cos\left(\frac{n\pi}{L}x\right)$
		$u_x(0,t) = u_x(L,t) = 0$	$a_n = \frac{2}{L}\int_0^L f(x)\cos\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 0$
$u_{xx} + u_{yy} = 0$	$0 < x < L$	$u(x,0) = f(x)$	$u(x,y) = \sum_n \left[a_n \frac{\sinh\left(\frac{n\pi}{L}(H-y)\right)}{\sinh\left(\frac{n\pi}{L}H\right)}\right] \sin\left(\frac{n\pi}{L}x\right)$
	$0 < y < H$	$u(x,H) = 0$	$a_n = \frac{2}{L}\int_0^L f(x)\sin\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
		$u(0,y) = u(L,y) = 0$	
		$u(x,H) = f(x)$	$u(x,y) = \sum_n \left[a_n \frac{\sinh\left(\frac{n\pi}{L}y\right)}{\sinh\left(\frac{n\pi}{L}H\right)}\right] \sin\left(\frac{n\pi}{L}x\right)$
		$u(x,0) = 0$	$a_n = \frac{2}{L}\int_0^L f(x)\sin\left(\frac{n\pi}{L}x\right)\,dx, \quad n \geq 1$
		$u(0,y) = u(L,y) = 0$	
		$u(x,0) = u(x,H) = 0$	$u(x,y) = \sum_n \left[a_n \frac{\sinh\left(\frac{n\pi}{H}(L-x)\right)}{\sinh\left(\frac{n\pi}{H}L\right)}\right] \sin\left(\frac{n\pi}{H}y\right)$
		$u(0,y) = f(y)$	$a_n = \frac{2}{H}\int_0^H f(y)\sin\left(\frac{n\pi}{H}y\right)\,dy, \quad n \geq 1$
		$u(L,y) = 0$	
		$u(x,0) = u(x,H) = 0$	$u(x,y) = \sum_n \left[a_n \frac{\sinh\left(\frac{n\pi}{H}x\right)}{\sinh\left(\frac{n\pi}{H}L\right)}\right] \sin\left(\frac{n\pi}{H}y\right)$
		$u(0,y) = 0$	$a_n = \frac{2}{H}\int_0^H f(y)\sin\left(\frac{n\pi}{H}y\right)\,dy, \quad n \geq 1$
		$u(L,y) = f(y)$	