EXTERNAL FORCED CONVECTION HEAT TRANSFER CORRELATIONS

Case	Regime flow	Correlations	Conditions
PARALLEL FLOW OVER A FLAT PLATE	**Laminar**	$C_{f,x} = \frac{0.664}{Re_x^{1/2}}$	$Re_x < 5 \times 10^5$ $\Pr > 0.6$
		$Nu_x = \frac{h_x.x}{k} = 0.332 Re_x^{0.5} Pr^{\frac{1}{3}}$	
	Turbulent	$C_{f,x} = \frac{0.059}{Re_x^{1/5}}$	$5 \times 10^5 \leq Re_x \leq 10^7$ $0.6 \leq \Pr \leq 60$
		$Nu_x = \frac{h_x.x}{k} = 0.0296 \mathrm{Re}_x^{0.8} \mathrm{Pr}^{\frac{1}{3}}$	
	Laminar	$C_f = \frac{1.33}{Re_L^{1/2}}$	$Re_L < 5 \times 10^5$
		$Nu = \frac{h.L}{k} = 0.664 Re_L^{0.5} Pr^{\frac{1}{3}}$	
	Turbulent	$C_f = \frac{0.074}{Re_L^{1/5}}$	$5 \times 10^5 \leq Re_L \leq 10^7$ $0.6 \leq \Pr \leq 60$
		$Nu = \frac{h.L}{k} = 0.037 Re_L^{0.8} Pr^{\frac{1}{3}}$	
	Combined	$C_f = \frac{0.074}{Re_L^{1/5}} - \frac{1742}{Re_L}$	$5 \times 10^5 \leq Re_L \leq 10^7$ $0.6 \leq \Pr \leq 60$
		$Nu = \frac{h.L}{k} = (0.037 Re_L^{0.8} - 871) Pr^{\frac{1}{3}}$	

EXTERNAL FORCED CONVECTION HEAT TRANSFER CORRELATIONS

Case	Regime flow	Correlations: local Nusselt Number (Nu_x)	Correlations: average convection coefficient (h)
ISOTHERMAL SURFACE WITH AN UNHEATED STARTING SECTION OF LENGTH (ξ)	Laminar	$Nu_x = \frac{Nu_{x\,(for\ \xi=0)}}{\left[1-(\xi/x)^{3/4}\right]^{1/3}} = \frac{0.332Re_x^{0.5}Pr^{\frac{1}{3}}}{\left[1-(\xi/x)^{3/4}\right]^{1/3}}$	$h = \frac{2\left[1-(\xi/x)^{3/4}\right]}{1-\xi/L}h_{x=L}$
	Turbulent	$Nu_x = \frac{Nu_{x\,(for\ \xi=0)}}{\left[1-(\xi/x)^{9/10}\right]^{1/9}} = \frac{0.0296Re_x^{0.8}Pr^{\frac{1}{3}}}{\left[1-(\xi/x)^{9/10}\right]^{1/9}}$	$h = \frac{5\left[1-(\xi/x)^{9/10}\right]}{1-\xi/L}h_{x=L}$

Case	Regime flow	Correlations: local Nusselt Number (Nu_x)
UNIFORM HEAT FLUX OVER A FLAT PLATE	Laminar	$Nu_x = 0.453Re_x^{0.5}Pr^{\frac{1}{3}}$
	Turbulent	$Nu_x = 0.0308Re_x^{0.8}Pr^{\frac{1}{3}}$

Case	Geometry	Correlations: Average Nusselt Number (Nu)
CROSS FLOW OVER A CYLINDER AND SPHERE	Cylinder	$Nu_{cyl} = \frac{h.D}{k} = 0.3 + \frac{0.62Re_x^{0.5}Pr^{\frac{1}{3}}}{\left[1+\left(0.4/Pr\right)^{2/3}\right]^{1/4}}\left[1+\left(\frac{Re}{282\,000}\right)^{5/8}\right]^{4/5}$
	Sphere	$Nu_{sph} = \frac{h.D}{k} = 2 + \left[0.4Re^{1/2} + 0.06Re^{2/3}\right]Pr^{0.4}\left(\frac{\mu_\infty}{\mu_s}\right)^{1/4}$