

Thermo-fluids Formula:

Heat Transfer

Conduction $\frac{dQ}{dt} = kA \frac{(T_1 - T_2)}{L}$

Convection $\frac{dQ}{dt} = hA (T_s - T_f)$

Radiation $\frac{dQ}{dt} = \epsilon \sigma A T_s^4$

Fluid Mechanics

Mass flow rate $\dot{m} = \rho A C = \frac{AC}{v}$

Volume flow rate $\dot{Q} = \frac{\dot{m}}{\rho}$

Continuity $A_1 C_1 = A_2 C_2$

Bernoulli's Equation

$$P_1 + \frac{1}{2} \rho C_1^2 + h_1 \rho g = P_2 + \frac{1}{2} \rho C_2^2 + h_2 \rho g + H_f$$

where $H_f = h_f \rho g$

First Law Applied to open Systems

$$\dot{m} [u_1 + P_1 v_1 + \frac{1}{2} C_1^2 + g z_1] + \dot{Q} + \dot{W} = \dot{m} [u_2 + P_2 v_2 + \frac{1}{2} C_2^2 + g z_2]$$