

CIVE240001 – Fluid Mechanics 2.2

Formula Sheet

Pipe Flow

Darcy-Weisbach formula
$$h_f = \frac{4flv^2}{2gd} = \frac{fLQ^2}{3d^5}$$

Rough pipe formula
$$\frac{1}{\sqrt{f}} = 4.0 \log_{10} \left(\frac{R}{k_s} \right) + 3.48$$

Colebrooke-White formula
$$\frac{1}{\sqrt{f}} = -4.0 \log_{10} \left(\frac{2.51}{2R_e \sqrt{f}} + \frac{k_s}{3.7d} \right)$$

Pumps

Work done per unit weight of fluid
$$= \frac{1}{g} (V_{w2} u_2 - V_{w1} u_1)$$

Hydraulic efficiency
$$\eta_h = \frac{gH}{V_{w2} u_2}$$

Specific speed
$$N_s = \frac{N \sqrt{Q}}{H^{3/4}}$$

Open channel hydraulics

Chezy formula
$$Q = AC \sqrt{mi}$$

Manning's formula
$$C = \frac{1}{n} m^{1/6}$$

Backwater function
$$\frac{dy}{dx} = \frac{i - j}{1 - F_n^2}$$

Specific energy
$$E = y + \frac{v^2}{2g}$$

Critical depth flumes
$$Q = 1.71 C_d B (E - h)^{3/2}$$

Specific force
$$F = A\bar{x} + \frac{Av^2}{g}$$

Conjugate depth equation
$$\frac{y_1}{y_2} = -\frac{1}{2} + \frac{1}{2} \sqrt{1 + 8F_{n2}^2}$$