

# Flow through Packed Beds

\* Ergun equation

$$\left(\frac{-\Delta P}{\rho U_0^2}\right) \left(\frac{D_p}{L}\right) \frac{\epsilon^3}{1-\epsilon} = \underbrace{\frac{150}{Re}}_{\text{laminar}} + \underbrace{1.75}_{\text{turbulent}}$$

Fictional dissipation term for packed beds

$$\frac{\Delta P}{\rho} + F = 0$$

$$F = -\frac{\Delta P}{\rho}$$

$$F = \frac{150 \mu_0 L (1-\epsilon)^2}{\rho D_p^2 \epsilon^3} + \frac{1.75 U_0^2 L (1-\epsilon)}{D_p \epsilon^3}$$

$$\epsilon = \frac{\text{Volume of void}}{\text{Total Volume of duct}}$$

$$= \frac{\text{Volume of duct} - \text{total Volume of particles}}{\text{Volume of duct}}$$

$a_v$  = surface area of a particle divided by its Volume

$D_p$  = Effective particle diameter  $\frac{6}{a_v}$