ISP 209 Equations for Exam 2

• Energy

 $K = \frac{1}{2} m v^2$ U = mgh (gravity; $g = 9.81 \text{ m/s}^2$) $U = \frac{1}{2} k x^2$ (spring; k = Hooke's constant) Power = Energy / Time

• Fluids

Archimedes' Principle : $F_{buoyancy} = \rho_{fluid} V g$

 $p(d) = p(0) + \rho g d$

Density of water = 1.0×10^3 kg/m³

 $1 \text{ atm} = 1.013 \times 10^5 \text{ N/m}^2$

• Static Electricity

 $F = \frac{KQ_1Q_2}{r^2}$ (Coulomb's law; $K = 8.99 \times 10^9 \text{ Nm}^2/\text{C}^2$) $E(\mathbf{x}) = \mathbf{F} / q$ (hypothetical test charge q) $Q = CV \text{ and } U = \frac{1}{2} Q V$ (capacitor; C = capacitance)

• Electric Current

$$I = \frac{\Delta Q}{\Delta t} \quad \text{or} \quad \Delta Q = I \,\Delta t$$

$$V = I R \quad (Ohm's law; R = resistance)$$

$$P = I V = t^2 R \quad (Joule's law)$$