

Formulae for basic electrical and electronic principles**General:**Charge $Q = It$ Force $F = ma$ Work $W = Fs$ Power $P = \frac{W}{t}$ Energy $W = Pt$ Ohm's law $V = IR$ or $I = \frac{V}{R}$ or $R = \frac{V}{I}$ Conductance $G = \frac{1}{R}$ Resistance $R = \frac{\rho l}{a}$ Power $P = VI = I^2R = \frac{V^2}{R}$ Resistance at $\theta^\circ\text{C}$, $R_\theta = R_0(1 + \alpha_0\theta)$ Terminal p.d. of source, $V = E - Ir$ Series circuit $R = R_1 + R_2 + R_3 + \dots$ Parallel network $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$ **Capacitors and Capacitance:** $E = \frac{V}{d}$ $C = \frac{Q}{V}$ $Q = It$ $D = \frac{Q}{A}$ $\frac{D}{E} = \epsilon_0 \epsilon_r$ $C = \frac{\epsilon_0 \epsilon_r A(n-1)}{d}$ $W = \frac{1}{2} CV^2$ Capacitors in parallel $C = C_1 + C_2 + C_3 + \dots$ Capacitors in series $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$ **Magnetic Circuits:** $B = \frac{\Phi}{A}$ $F_m = NI$ $H = \frac{NI}{l}$ $\frac{B}{H} = \mu_0 \mu_r$ $S = \frac{\text{m.m.f.}}{\Phi} = \frac{l}{\mu_0 \mu_r A}$ **Electromagnetism:** $F = BIl \sin \theta$ $F = QvB$ **Electromagnetic Induction:** $E = Blvs \sin \theta$ $E = -N \frac{d\Phi}{dt} = -L \frac{dI}{dt}$ $W = \frac{1}{2} LI^2$ $L = \frac{N\Phi}{I} = \frac{N^2}{S}$ $E_2 = -M \frac{dI_1}{dt}$ $M = \frac{N_1 N_2}{S}$ **Measurements:**Shunt $R_s = \frac{I_a r_a}{I_s}$ Multiplier $R_M = \frac{V - Ir_a}{I}$ Power in decibels $= 10 \log \frac{P_2}{P_1}$ $= 20 \log \frac{I_2}{I_1}$ $= 20 \log \frac{V_2}{V_1}$ Wheatstone bridge $R_X = \frac{R_2 R_3}{R_1}$ Potentiometer $E_2 = E_1 \left(\frac{l_2}{l_1} \right)$ These formulae are available for downloading at the website:
www.routledge.com/cw/bird