Basic mechanics and electronics

Momentary Speed

$$v_{medel} = \frac{s}{t}, \;\; v_{momentant} = \frac{ds}{dt}$$

Momentary Acceleration

$$a_{medel} = \frac{v}{t} = \frac{v^2 - V_0^2}{2s}$$

$$a_{momentan} = \frac{dv}{dt} = \frac{d^2x}{dt^2}$$

Momentum

$$\mathbf{p} = \mathbf{m} \cdot \mathbf{v}$$

Force

$$\mathbf{F} = \frac{d\mathbf{p}}{dt} = \frac{m \cdot d\mathbf{v}}{dt} = m \cdot \mathbf{a}$$

Work

$$W = \int_{s_1}^{s_2} \mathbf{F} \cdot \mathbf{ds}$$

Kinetic energy

$$W_{[}kin] = \frac{m \cdot v^2}{2}$$

Potential energy

$$W_{pot} = -\int_{A}^{B} \mathbf{F} \cdot \mathbf{ds} = \mathbf{W_{pot}(B)} - \mathbf{W_{pot}(A)}$$

Effect

$$P_{medel} = \frac{W}{t}$$

$$P_{momentan} = \frac{dW}{dt}$$

Coulumbs law

$$F = \frac{1}{4\pi\epsilon_0} \frac{q_1 \cdot q_2}{r^2}$$

Electric flow

$$\Phi_E = \mathbf{E} \cdot \mathbf{dA}$$

Force on charge in electric field

$$\mathbf{F} = \mathbf{q} \cdot \mathbf{E}$$

Force on charge in electric field

$$F = q \cdot v \cdot B$$

Where v is perpendicular to B.

Electric potential energy

$$W = q \cdot E \cdot d$$

Voltage

$$U = \frac{W}{q}$$

Energy in condensator

$$W = \frac{1}{2} \cdot Q \cdot U$$

Instantaneous current

$$I_{medel} = \frac{Q}{t}, i = \frac{dq}{dt}$$

Ohms law

$$U = R \cdot I$$

Resistivity

$$R = \rho \frac{L}{A}$$

Temperature dependence

$$R_t = R_0[1 + \alpha(T - T_0)]$$

Where R_0 is the resistance at temperature T_0

Battery

$$U = E - R_i \cdot I$$

Electric average power

$$P_{medel} = \frac{W}{t} = U \cdot I$$

Series circuit

$$U_{TOT} = U_1 + U_2 + ...$$

Resistance in series circuit

$$R_{TOT} = R_1 + R_2 + ...$$

Parallel circuit

$$I_{TOT} = I_1 + I_2 + ...$$

Resistance in Parallel circuit

$$\frac{1}{R_{TOT}} = \frac{1}{R_1} + \frac{1}{R_2} + ...$$

Kirchhoffs law 1

$$I_1 + I_2 + I_3 + ... = 0$$

Kirchhoffs law 2

$$U_1 - R_1 I - R_2 I - U_2 = 0$$

Charge of condensator

$$Q = C \cdot U$$

Plate capacitor

$$C = \frac{\epsilon_r \epsilon_0 A}{d}$$

Energy in Capacitor

$$W = \frac{Q \cdot U}{2}$$

Capacitance is series circuit

$$\frac{1}{C_{TOT}} = \frac{1}{C_1} + \frac{1}{C_2} + ...$$

Capacitance is Parallel circuit

$$C_{TOT} = C_1 + C_2 + ...$$

Magnetic flow

$$\Phi_m = \mathbf{B} \cdot \mathbf{dA}$$