

SESSION IV

Electric Flux:

$$\Phi = \int \vec{E} \cdot d\vec{s}$$

For a point charge

$$\Phi = \frac{q}{4\pi\epsilon_0 r^2} \cdot 4\pi r^2 = \frac{q}{\epsilon_0}$$

Gauss' Law:

$$\oint E \cdot ds = \frac{q}{\epsilon_0}$$

Applications:

Spherical Shell

$$E = \frac{Q}{4\pi\epsilon_0 r^2}$$

Solid sphere

$$E = \frac{Q}{4\pi\epsilon_0 r^2} \text{ outside}$$

$$E = \frac{Qr}{4\pi\epsilon_0 R^3} \text{ inside}$$

Plane of Charge

$$E = \frac{\sigma}{2\epsilon_0}$$

Conductors

$E=0$ inside a metal (for static electric fields)

$E_{\parallel} = 0$ on the surface of a conductor

$E_{\perp} > 0$