Module 2 Unit 2

DIELECTRICS – FORMULA SHEET

Parameter	Formula
1. Capacitance (parallel plate)	$C = \frac{k\epsilon_0 A}{d}$; (k or ϵ_r)
2. Electric field, Voltage (capacitor)	$E = \frac{Q}{k\epsilon_0 A}$, $V = \frac{Q\,d}{k\epsilon_0 A}$
3. Fundamental electric quantities	$\vec{D} = \epsilon_0\vec{E} + \vec{P}$ $\vec{P} = \epsilon_0(k-1)\vec{E} = \epsilon_0\chi_e\vec{E} = N\alpha\vec{E}$ $\alpha = \frac{\epsilon_0(k-1)}{N}$
4. Electric susceptibility	$\chi_e = k - 1$ or $\epsilon_r - 1$
5. Electric dipole moment	$\vec{\mu} = \alpha\vec{E}$, $\vec{P} = \frac{\sum_j \vec{\mu}_j}{V} = N\vec{\mu}_{avg}$
6. Clausis-Mossotti equation	$\alpha = \frac{3\epsilon_0(k-1)}{N(k+2)}$
7. Electronic polarizability	$\alpha_e = 4\pi\epsilon_0 R^3$
8. Internal field in solids	$\vec{E}_i = \frac{\gamma\vec{P}}{\epsilon_0}$
