Physics 842 – Fall 2011

Classical Electrodynamics II

Notation differences between Landau & Lifshitz and PHY842 lectures & homeworks

Physical quantity	Landau & Lifshitz	PHY842 lectures and homeworks
Chapters 1 and 2:		
electric charge	e	q
dielectric susceptibility	κ	χ_e
Chapter 3, section 26 has some confusing definitions:		
chemical potential	ζ	μ
internal chemical potential	ζ_0	μ_{int}
energy flux density	$\mathbf{q}$	$\mathbf{j}_\varepsilon$
heat current	$\mathbf{q} - \phi\mathbf{j}$	$\mathbf{j}_q = \mathbf{j}_\varepsilon - \mu\mathbf{j}_n$

Landau & Lifshitz redefine ϕ on page 97 as $\phi + \zeta_0/e$ to include the chemical potential. The new ϕ introduced by L&L is equal to μ/q in my notation.
The modern way to view this is to say that the total chemical potential is a sum of an "internal" term and an "external" term: $\mu = \mu_{int} + \mu_{ext} = \mu_{int} + q\phi$, where ϕ is the usual electrostatic potential. (The external term could also include the effect of gravity or any other external force.)

thermopower	α	S
Chapter 4:		
total current density	$\rho\mathbf{v}$	$\mathbf{j}$ or $\mathbf{j}_{total}$
contributions to current	$\rho\mathbf{v} = c\nabla\times\mathbf{M} + \mathbf{j}$	$\mathbf{j}_{total} = c\nabla\times\mathbf{M} + \mathbf{j}_{free}$
surface current density	$\mathbf{g}$	$\boldsymbol{J}$

(I do not like the L & L use of $\rho\mathbf{v}$ for total current density, since "bound currents" include electric spins, which cannot be thought of as a charge density ρ moving at velocity **v.)**