

## Notes on E&M II Final (2017)

PHY4324.001 final will cover Chapter 6 through Chapter 11. (267 ~ 487).

50% comes from Chapters 6, 7, 8, 9. (Study Tests #1 & #2).

50% comes from Chapters 10, 11. This note will cover this part.

Important concepts and formula:

- (a) Maxwell's equation (eq. 7.40) pp.337
- (b) Concepts of Gauge transformation. (eq. 10.7)
- (c) Coulomb gauge (10.8) and Lorentz gauge (10.12)
- (d) The concept of cutoff frequency in waveguide. (Eq. 9.191).
- (e) Skip 9.5.3.
- (f) What is Gauge transformation? (Page 439-440). (Eq. 10.7)
- (g) Condition for Coulomb gauge, and how it modifies Eq. 10.4?
- (h) Condition for Lorentz gauge, and how it modifies Eq. 10.5?
- (i) Concept of retarded time. (Eq. 10.25)
- (j) Concept of retarded potentials. (Extension of eq.10.24 to time-dependent sources, eq. 10.26).
- (k) Skip 10.2.2 Jefimenko's Equations.
- (l) Lienard-Wiechert potentials. (Page 451)
- (m) Given Eq. 10.72, the meaning of 1<sup>st</sup> term, and 2<sup>nd</sup> term.
- (n) Skip Example 10.3 study Example 10.4.
- (o) Study problem 10.19 and 10.20.
- (p) Electric dipole radiation (11.1.2)
- (q) Magnetic dipole radiation (11.1.3)
- (r) Radiation from an arbitrary source (11.14). Notice the approximations are different from 11.1.2 and 11.1.3.
- (s) Concepts of various approximations, perfect dipole approximation, long wavelength approximation, far-field approximation.
- (t) Eq. 11.21. and Figure 11.4.
- (u) Example 11.1. Why the sky is blue and the sunset is red? (Eq.11.22 and Fig.11.6)  
Why parts of the sky is polarized? (Fig.11.5)
- (v) Compare electric dipole radiation (Eq.11.22) with magnetic dipole radiation (Eq.11.40)
- (w) Example 11.2
- (x) Larmor formula. (Eq. 11.61).
- (y) Eq. 11.62 and the meaning of the first term and second term.
- (z) Skip 11.2.2 and 11.2.3.