NASSP Honours Electrodynamics 1 **1st Semester 2014**

Study Guide (for Test and Exam)

1.	Gauss, Faraday laws in integral form	revision
	Ampere's law plus displacement current	revision?
	Maxwell's equations in integral form	revision
2.	Electrostatic field conservative	revision
	Gauss law and Poisson eqn.	understand significance
	Multipole expansion of V	interpretation of terms only
3.	Polarization and bound charges	know definition, derivation
	Polarization current density	know def., relationship
	Electric displacement	know def., derivation
	lih dielectrics	know definitions
	Boundary conditions for D, E	know derivations
	Electric field energy	know result; derivation not required
4.	Currents, continuity equation	understand integral and diff forms
	Origin of magnetic field	derivation definitely not required!
	Biot Savart law	revision, but note generalised form
	Ampere's law in differential form	know result and derivation
	Magnetic vector potential	understand significance
	Multipole expansion of A	interpretation of terms only
5.	Magnetic materials	know defs., understand equiv. currents
	H field	know def., derivation
	Susceptibility, permeability	know definitions
	Boundary conditions for B, H	know derivation
	Magnetic field energy + pressure	know result for u; know derivation
6.	Faraday's law in differential form	know result and derivation
	Scalar and vector potentials	derivation of eqn for E
	Lorenz condition	derivation not required
	Ampere's law revisited	understand Maxwell resolution
	Displacement current	understand modified Ampere law
	Maxwell's equations	should become very familiar!
	Helmholtz theorem	mathematical detail not required
	Gauge transformations	understand arguments, Lorenz
7.	Retarded potentials	understand significance (for future ref.)
	Energy and Poynting's theorem	know derivation, def. of S
	Wave equations for E, B	know derivations
	Plane waves: relationship E to B	know derivation
	Energy in EM waves	understand; know def. of intensity (not pressure)

8.	EM waves in (linear) materials	understand replacement of ε_0, μ_0 with ε , μ
	Wave energy in materials	ditto, plus $c \rightarrow v$ and know def. of n
	Plane waves at material interfaces	treat general case of oblique incidence
	Laws of reflection & refraction	know derivations from boundary conditions
	Fresnel's equations	know derivations (for E in plane of incidence)
	EM waves in conductors	know derivation of wave eqns; not of k, kappa
9.	Dispersion and group velocity	know definitions, show $v_g < v$ normally
	Polarization of EM waves	understand complex amplitudes, role of phase diff.;
	Linear, circular, elliptical polarization	determine polarization state from eqn. & vice versa
	Linear polarizers, Malus's law	revision
	Wave plates	understand birefringence, origin of phase diff.
	Polarization by reflection	qualitative (descriptive) only
	Polarization by scattering	qualitative only
	Partial polarization	know def. of degree of polarization
	Stokes' parameters	details not required
	Optical activity & Faraday rotation	qualitative only
+	Work through Tutorial problems	
	Follow Worked Examples where appropriate	