

I. Electromagnetic Theory

- A. Maxwell's equations (instantaneous/phasor forms)
- B. Complex permittivity and permeability
- C. Electromagnetic boundary conditions
 - 1. Dielectric interface
 - 2. PEC surface, PMC surface
- D. Electromagnetic waves
 - 1. Uniform plane waves
 - a. Lossless, lossy media
 - b. Good conductor (skin depth, surface resistance)
 - 2. Poynting's theorem
 - 3. Plane wave reflection/transmission at a planar interface
 - 4. Image theory

II. Transmission lines

- A. Transmission line segment equivalent circuit
- B. Transmission line equations
 - 1. Characteristic impedance
 - 2. Propagation constant (attenuation constant/phase constant)
 - 3. Phase velocity, wavelength
- C. Terminated transmission lines
 - 1. Reflection coefficient
 - 2. Input impedance
 - 3. Special case loads (short-circuit, open-circuit, matched load)
 - 4. Standing wave ratio (voltage/current minimums and maximums)
 - 5. Power flow
 - 6. Return loss
 - 7. Insertion loss
- D. Smith Chart
- E. Lossy transmission lines
 - 1. Low loss line
 - 2. Distortionless line
- F. Perturbation method
- G. Wheeler incremental inductance rule