

EE 483/L 583/L Antennas for Wireless Communications

3-1 (4 credit hours)

Text: *Antenna Theory: Analysis and Design* (Fourth Edition), Balanis, 2016

Chapter 2 Fundamental Parameters of Antennas

- radiation pattern(s)
- power density/Poynting vector
- radiation intensity
- beamwidth, i.e., half-power beamwidth (HPBW) and first null beamwidth (FNBW)
- directivity & gain
- bandwidth
- polarization
- input impedance, reflection coefficient, & VSWR
- radiation resistance and loss resistance
- antenna efficiency
- vector effective length & effective area
- Friis transmission equation
- Radar range equation

Chapter 3 Radiation Integrals & Aux. Potential Functions

- Calculate the electric and/or magnetic fields from \bar{A} or \bar{F} .
- Calculate the far-field electric and/or magnetic fields from \bar{A} or \bar{F} .

Chapter 4 Linear Wire Antennas

- infinitesimal dipoles
- small dipoles
- finite length dipole
- half-wavelength dipole
- monopoles
- region separation

Chapter 5 Loop Antennas

- small circular loop antenna
- circular loop antenna w/ constant current
- multi-turn loop antennas
- circular loop antenna w/ nonuniform current

Chapter 6 Arrays

- Be able to design/analyze N-element linear arrays with uniform amplitude & spacing and linear progressive phase shift for broadside, ordinary end-fire, Hansen-Woodyard end-fire, and arbitrary angle/scanning arrays.
- Find location of nulls & maxima in AF
- Determine if there will be grating lobe(s) in AF
- Find angles of half-power points in AF and HPBW
- Find approximate directivity of AF for broadside, ordinary end-fire, and Hansen-Woodyard end-fire arrays.

Folded Dipoles - Chapter 9.5 & notes

- Be able to analyze/design a folded dipole

Matching Techniques - Chapter 9.7 & notes

- Be able to analyze/design a T-, modified T-, Gamma, and Modified Gamma matches.
- Be able to match an antenna using a parallel or series discrete component.
- Be able to match an antenna using a shunt single stub tuner w/ open or short circuit termination.
- Be able to match an antenna using a quarter-wavelength transformer (QWT).

Helical Antennas - Chapter 10.3.1 & notes

- Be able to analyze/design a normal mode helical antenna
- Be able to analyze/design an axial mode helical antenna

Yagi-Uda arrays - Chapter 10.3.3 & notes

- Be able to design a standard Yagi-Uda antenna

Log-periodic dipole arrays (LPDA)- Chapter 11.4 & notes

- Be able to design an LPDA

Chapter 14 Microstrip Antennas

- Be able to analyze/design a rectangular microstrip patch antenna along with feeding microstrip and inset feed.