

## **ECE 4990 - Antennas**

**Textbook:** Constantine A. Balanis, Antenna Theory: Analysis and Design, 2nd. Ed.

### **Detailed Course Outline:**

#### **I. Antenna Operation**

- A. Types of Antennas
- B. Antenna Radiation
  - 1. Antenna Patterns
  - 2. Average Power
  - 3. Radiation Intensity
- C. Directivity
- D. Gain
- E. Efficiency
- F. Antenna Impedance
  - 1. Radiation Resistance
  - 2. Loss Resistance
  - 3. Antenna Reactance
- G. Antenna Systems
  - 1. Matching
  - 2. Transmit/Receive Systems
  - 3. Radar Systems
- H. Polarization

#### **II. Antenna Analysis**

- A. Potential Functions
- B. Far Field Approximation
- C. Duality
- D. Reciprocity
- E. Image Theory
- F. Antennas over Ground

#### **III. Characteristics of Specific Antennas**

- A. Wire Antennas
  - 1. Hertzian Dipole
  - 2. Short Dipole
  - 3. Half-Wave Dipole
  - 4. Center-Fed Dipole
  - 5. Monopole
  - 6. Loop Antennas
- B. Antenna Arrays
  - 1. Broadside Arrays
  - 2. Endfire Arrays
  - 3. Hansen-Woodyard Array
  - 4. Binomial Array
  - 5. Dolph-Chebyshev Array
- C. Folded Dipole
- D. Traveling Wave Antennas
- E. Vee Antenna
- F. Rhombic Antenna
- G. Yagi-Uda Arrays
- H. Log-Periodic Antenna
- I. Aperture Antennas
- J. Horn Antennas