Department of Electrical Engineering

Ira A. Fulton School of Engineering

Arizona State University

EEE 543 Antenna Analysis And Design 3 hours rec.

Prerequisites: **EEE 443 or equivalent**

Text: **Antenna Theory: Analysis and Design** (4th Edition, 2016) by C. A. Balanis

Reference Books:
Antenna Analysis by E. A. Wolff
Microwave Antenna Theory and Design by S. Silver
Antennas by J. D. Kraus
Antenna Theory and Design by W. L. Stutzman and G. A. Thiele
Antenna Theory and Design by R. S. Elliott

Course Syllabus: Antenna synthesis and continuous sources, impedances, broadband antennas, frequency independent antennas, miniaturization, aperture antennas, horns, reflectors, and measurement techniques.

OUTLINE

	TOPIC	**Approximate number of 75-minute periods**
I.	**Information/Review**	**1**
II.	**Antenna Synthesis and Continuous Sources**	**2**
	a. Schelkunoff polynomial method	
	b. Fourier transform method	
	c. Woodward Lawson method	
	d. Taylor line-source (Tschebyscheff error)	
	e. Taylor line-source (one-parameter)	
	f. Triangular, cosine, and cosine-squared	
III.	**Self and Mutual Impedances of Linear Elements and Arrays**	**2**
	a. Near-fields of dipole	
	b. Input impedance of dipole	
	c. Mutual impedance between linear elements	
	d. Mutual coupling in arrays	
	Test 1	**1**

IV. Broadband Dipoles and Matching Techniques **3**
- a. Biconical Antenna
- b. Triangular sheet, bow-tie, and wire simulation
- c. Cylindrical, folded, discone and conical skirt, and sleeve dipoles
- d. Matching techniques

V. Traveling Wave and Broadband Antennas **2**
- a. Traveling wave antennas
- b. Broadband antennas (helix, magnetic-electric dipole, Yagi-Uda)

VI. Frequency Independent Antennas and Antenna Miniaturization **1**
- a. Equiangular spiral antennas
- b. Log-periodic antennas
- c. Fundamental limits of electrically small antennas

VII. Aperture Antennas **5**
- a. Field equivalence principle (Huygen's Principle)
- b. Radiation equations
- c. Rectangular apertures
- d. Circular apertures
- e. Design considerations
- f. Babinet's Principle

VIII. Horn Antennas **3**
- a. E-plane sectoral horn
- b. H-plane sectoral horn
- c. Pyramidal horn
- d. Conical horn
- e. Corrugated horn
- f. Aperture-matched horn
- g. Phase center

Test 2 **1**

IX. Microstrip Antennas **3**
- a. Rectangular patch
- b. Circular patch
- c. Quality factor, bandwith, efficiency, input impedance, coupling
- d. Circular polarization

X. Reflector Antennas **2**

a. Corner reflector
b. Parabolic reflector
c. Spherical reflector

XI. Smart Antennas **2**

XII. Measurements **2**

Final Exam

University Academic Integrity Policy (AIP) refers to each student's obligation to act with honesty and integrity and to respect the rights of others in carrying out all academic assignments. Violations of the University AIP will not be ignored. Penalties include reduced or no credit for submitted work, a failing grade in the class, a note on your official transcript that shows you were punished for cheating, suspension, expulsion and revocation of already awarded degrees. The University requires that should I implement any penalty for violations of the academic integrity policy, I must report the matter to the Dean's office. The University has a Student Academic Integrity Policy, which will be followed in EEE 543.

August 15, 2016