

## EEE 443 Antennas for Wireless Communications (3) [S]

### Course (Catalog) Description:

Fundamental parameters; radiation integrals; wireless systems; wire, loop, and microstrip antennas; antenna arrays; smart antennas; ground effects; multipath.  
Lecture. Technical Elective.

### Prerequisite:

EEE 341.

### Textbook:

C.A. Balanis, *Antenna Theory: Analysis and Design*, 3<sup>rd</sup> Edition 2005, John Wiley and Sons  
ISBN:1997 047166782-X.

### Supplemental Materials:

W.L. Stutzman and G.A. Thiele, *Antenna Theory and Design*, John Wiley and Sons, 1981. R.S. Elliott, *Antenna Theory and Design*, Prentice-Hall, 1981. J.D. Kraus, *Antennas*, McGraw-Hill, 1988.

### Coordinator:

James T. Aberle

### Prerequisites by Topic:

1. Maxwell's equations
2. Plane and spherical waves in free space
3. Reflection and refraction
4. Phasor algebra; vector analysis; line, surface, and volume integrals
5. Introductory computer programming

### Course Objective:

1. Students learn the fundamentals of antenna analysis and design, and also be able to converse with other engineers on this topic

### Course Outcomes:

1. Students will learn the fundamentals of antenna analysis design, and measurements
2. Students will be able to converse with technologists of the same field
3. Students will be able to integrate antenna technology with overall communication system design and performance

### Course Topics:

1. Fundamental parameters, definitions, and antenna applications (12 classes)
2. Vector potentials, radiation integrals, and antenna theorems (3 classes)
3. Wire antennas and ground effects (8 classes)
4. Loop antennas and ground effects (4 classes)
5. Arrays and synthesis models; linear, planar, and circular (12 classes)
6. Measurements (3 classes)

7. Tests (3 classes)

**Computer Usage:**

Three homework assignments, one each in topics 1, 3, and 5, are required.

**Laboratory Experiments:** None.

**Course Contribution to Engineering Science and Design:**

Student learn to apply integral equations derived using Maxwell's equations to radiating structures with solutions ranging from simple assumed current distributions to potentially exact numerical solutions. Students learn to design antennas with specific radiation characteristics and how to realize matching networks for these antennas.

**Course Relationship to Program Outcomes:**

**a:** Mathematics, Physics, and Engineering principles used to present the course material. Students learn how a critical component of modern wireless communications systems works, and how to design antennas for certain specific applications that meet economic and other constraints.

**k:** Use of current simulation software and techniques to solve problems.

Person preparing this description and date of preparation: James Aberle, K. Tsakalis, March 2009, June 2015.