**ELEN 4130 ‑ Antenna Theory and Design**

**Class Schedule:** 3 Credit course, meeting the equivalent of 3-50 minute class periods per week.

**Course Coordinator**: James E. Richie

**Course Materials:**

**Required:** W. L. Stutzman and G. A. Thiele,Antenna Theory and Design, 3rd Ed., John Wiley

& Sons, 2013.

**Course Description:**

Design and use of antennas of varying types, including wire, broadbands, horn, and reflector antennas in transmitting and receiving applications. The application and design of antenna arrays, and an introduction to diffraction theory.

**Prerequisites:**        ELEN 3120

**Selected Elective** in the Electromagnetic Fields and Communication area.

**Contribution to Professional Component:** Engineering Science 50 %

Engineering Design 50 %

**Course Goals:**

To enable the students to understand, analyze, and design antennas and arrays of varying types and to introduce numerical methods, including the method of moments, and high frequency techniques.

**Course Objectives**

*By the end of this course, you should be able to....*

1. Compute the far field distance, radiation pattern and gain of an antenna given the current distribution.
2. Estimate the input impedance, efficiency and ease of match for antennas.
3. Compute the array factor for an array of identical antennas.
4. Design antenna arrays for various desired radiation pattern characteristics.
5. Design wire antennas.
6. Design traveling wave wire antennas.
7. Design helical antennas for both the normal mode and axial mode of operation.
8. Design broadband and frequency independent antennas.
9. Analyze and design horn antennas and reflector antenna systems.
10. Use the concepts of diffraction theory and physical optics to develop intuition regarding the radiation and scattering of fields.
11. Use the method of moments to analyze wire antennas.

**Contribution to Program Objectives:** Partial fulfillment of Criterion 3 objectives A, C, E, G, K

**Course Topics: In the text**

Antenna Fundamentals Chapters 1, 9

Radiation Pattern

Antenna Impedance and Efficiency

Antennas in Comm. Links and Radar

Receiving Properties of Antennas

Power Budget Calculations

Simple Radiating Systems Chapter 2

Image Theory

Small Antennas

Half Wave Dipole

Arrays of Antennas Chapter 3

Uniform Linear Arrays

Endfire Arrays

Pattern Synthesis Chapter 8

Line Sources Chapter 4

Uniform Line Source

Tapered Line Sources

Wire Antennas and Moment Methods

The NEC Code Course Notes

Dipoles (straight, folded, vee) Chapter 5

Traveling Wave Wire Antennas Chapter 6

Broadband Antennas Chapter 6

Aperture Antennas Chapter 7

Last modified: December 4, 2017