

**ANTENNA THEORY AND DESIGN**  
University of Massachusetts Amherst  
ECE 687

Instructor Do-Hoon Kwon  
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Class meetings TuTh 11:30AM–12:45PM  
Room E-Lab 327  
Office hours 12:45–1:15PM on TuTh and by appointment

**Course Objectives**

In this course, the student will acquire the following skills. He/she should be able to:

1. Understand and use the standard antenna parameters
2. Understand and compute near- and far-field quantities from several common antennas
3. Design simple antennas to achieve specified electrical performance
4. Design antenna arrays with required radiation pattern characteristics
5. Understand self/mutual impedances and use MoM numerical analysis
6. Critically evaluate requirements and potential design options for applications

**Prerequisites**

Basic EM Analysis, Plane Waves, Transmission Lines, Rectangular Waveguides and Resonators, and Radiation from Current Filament.

**Course Website**

Moodle

**Textbook**

C. A. Balanis, *Antenna Theory: Analysis and Design*, 4th ed., Hoboken, NJ: Wiley, 2016.

**Reference**

W. L. Stutzman and G. A. Thiele, *Antenna Theory and Design*, 3rd ed., Hoboken, NJ: Wiley, 2013.

**Course Requirements**

Homeworks, one midterm exam, and a final exam.

**Grading Policy**

Homework	20 %
Midterm Exam	40 %
Final Exam	40 %

Homework assignments are due at the beginning of the class period on the due date. Late homework will NOT be accepted. Late submissions under extenuating circumstances (e.g. a research-related travel) should be arranged in advance with the instructor.

## Course Topics

1. Fundamental quantities of antennas (ch. 2) [3 lectures]
2. Basic wire antennas: dipole, loop (ch. 4, 5) [3 lectures]
3. Method of Moments (ch. 8) [3 lectures]
4. Antenna arrays (ch. 6) [4 lectures]
5. Antenna synthesis (ch. 7) [3 lectures]
6. Aperture antennas (ch. 12, 13) [4 lectures]
7. Reflector antennas (ch. 15) [3 lectures]
8. Broadband/wideband antennas (sec. 10.3) and microstrip patch antennas (ch. 14) [3 lectures]

## Computer Requirements

The software *PCAAD* – *Personal Computer Aided Antenna Design* (Antenna Design Associates, Inc.) may be used by students for homework. Some computer analysis using PCAAAD and/or general-purpose tools (MathCad, Matlab, etc) may be necessary for homework.

## Academic Honesty

The students of this course are expected to abide by the Academic Honesty Policy of the University, available online at <https://www.umass.edu/honesty>.

## Inclusivity Statement

The diversity of the participants of this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued or respected for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing, speak with Assistant Dean Dr. Paula Rees ([rees@umass.edu](mailto:rees@umass.edu), 413.545.6324, or in person in 128b Marcus Hall, within the Engineering Community, Equity and Inclusion Hub across from the coffee shop). You may also submit any concerns or comments through the College of Engineering Climate Concerns and Suggestions on-line form (<https://tinyurl.com/UMassEngineerClimate>) and/or the Positive and Negative Classroom Experience online form (<https://tinyurl.com/UMassEngineerClassroom>). We are all members of an academic community with a shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect.