

EEE 445 Microwaves (4) [F]

Course (Catalog) Description:

Waveguides; circuit theory for waveguiding systems; microwave devices, systems, and energy sources; striplines and microstrips; impedance matching transformers; measurements. Lecture, lab. Technical elective.

Prerequisite:

EEE 341.

Textbook:

D.M. Pozar, *Microwave Engineering*, Addison-Wesley, 1990.

Supplemental Materials:

- R.S. Elliott, *An Introduction to Guided Waves and Microwave Circuits*, Prentice-Hall, 1993.
- R.E. Collin, *Foundations for Microwave Engineering*, McGraw-Hill, 1996.
- D.K. Chen, *Field and Wave Electromagnetics*, Addison-Wesley, 1989.
- Ramo, Whinnery, and Vanducer, *Fields and Waves in Communication Electronics*.

Coordinator:

George Pan, Professor

Prerequisites by Topic:

1. Network and circuit theory
2. Transmission lines
3. Wave propagation

Course Objective:

1. To acquaint students with microwave circuits and systems

Course Outcome:

1. Students will acquire the skills to identify and solve problems including microwave circuits and systems such as microstrip lines, couplers, hybrids, and waveguides

Course Topics:

1. Review of transmission lines and waveguides (Chapter 4)
2. Microstrip and striplines (Chapter 4)
3. Microwave network analysis (Chapter 5)
4. Review of different matching techniques (Chapter 6)
5. Multisection and tapered matching (Chapter 6)
6. Review of transmission line and waveguide resonators (Chapter 7)
7. Other types of microwave resonators (Chapter 7)
8. Dividers, couplers, hybrids (Chapter 8)
9. Active microwave circuits (Chapter 11)

A general introduction to microwave systems and applications of microwaves will be discussed as well.

Computer Usage:

1. A design project and simulation, including the following project topics:
2. Hybrid couplers
3. Coupled lines
4. Matching networks

Laboratory Experiments:

1. Students meet weekly for a three-hour laboratory under the guidance of a TA.
2. Network analyzers
3. Bandpass filter
4. Isolator and circulator microstrip line
5. Microcircuit bandpass filter
6. Time domain measurement
7. Power measurement
8. Cavity and resonator

Course Contribution to Engineering Science and Design:

Student learn to design, simulate and test basic microwave circuits including matching circuits, couplers, and resonators.

Course Relationship to Program Outcomes:

a: math and engineering principles

k: use of modern tools for simulation

People preparing this description and date of preparation: Elbadawy Elsharawy, George Pan, Jim Aberle, K. Tsakalis, March 2009, June 2015.