

EE 4368. RF Circuit Design Principles

Instructor:

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Catalog Description:

EE 4368 RF Circuit Design Principles (3 semester hours) Transmission lines, the Smith chart, impedance matching, simple amplifier design, power coupling, waveguides and lossy transmission lines. Prerequisite: EE4301, Recommended co-requisite: EE 3311. (3-0) Y

Course Objectives:

1. Demonstrate an understanding of the circumstances which require RF design techniques.
2. Demonstrate an understanding of the variation of impedance along a loaded transmission line.
3. Demonstrate the ability to use the Smith Chart to solve loaded transmission line problems.
4. Demonstrate the ability to design impedance-matching networks using lumped components.
5. Demonstrate the ability to design impedance-matching networks using distributed components.
6. Demonstrate the ability to design a single-stage microwave amplifier using impedance-matching networks.

Textbook: R. Ludwig and P. Bretchko, *RF Circuit Design: Theory and Applications* (Prentice Hall, 2000).

Course Outline:

1. Background (Ch 1)
 - a. When is RF design required?
 - b. Passive components and their parasitics.
2. Transmission lines (Ch 2)
 - a. Types of transmission lines
 - b. Mathematical description
 - c. Impedance
 - d. Termination and impedance matching
 - e. Traveling and standing waves
 - f. *Lossy transmission lines*
3. The Smith Chart (Ch 3)
 - a. Reflection coefficient \Leftrightarrow load impedance
 - b. Impedance transformations
 - c. Combining lumped and distributed elements
4. Network theory (Ch 4)
 - a. 2-port parameters
 - i. ABCD representation
 - ii. S-parameters
5. Active RF components (Ch 6-7)
 - a. Diodes
 - i. Detector
 - ii. Switching
 - iii. Oscillating
 - b. Transistors
 - c. Modeling active components
6. Matching and biasing networks (Ch 8)
7. RF transistor amplifier design (Ch. 9)