Purpose: Learn the principles of designing modern microwave and RF circuits.

SYLLABUS

1. EM THEORY REVIEW

Wave equation, plane-wave solutions, good dielectrics, good conductors, skin-depth.

2. IDEAL TRANSMISSION-LINE (TL) THEORY

Circuit model for a TL, TL-equations, time-harmonic solutions, lossless line, low-loss line, terminated line, impedance-transformation, Smith chart.

3. IMPEDANCE MATCHING

L-matching networks, single-stub tuning, double-stub tuning, multi-section transformers.

4. PLANAR TRANSMISSION LINE SYSTEMS

Stripline, microstrip, coplanar waveguide CPW, microstrip discontinuities, introduction to Monolithic Microwave Integrated Circuits (MMIC’s).

5. DESIGNING WITH SCATTERING PARAMETERS

Equivalent voltages & currents, impedance & admittance matrices, scattering matrix, ABCD matrix, 2-port networks.

6. PRACTICAL 3-PORT & 4-PORT DEVICES

Properties of 3-ports & 4-ports, even-odd mode analysis, Wilkinson power divider/combiner, branch line and ring couplers, coupled-lines, coupled-line coupler, Lange coupler.
7. ACTIVE RF/MICROWAVE CIRCUITS

Transistor amplifier design, stability, noise, diode mixers, RF receiver chains.

8. MICROWAVE FILTERS

Insertion loss method for filter-design, Binomial filters, Chebyshev filters, filter transformations, filter implementation, Richard’s transformation, Kuroda’s identities, stepped-impedance filters.

TEXTBOOK

Required:

Recommended:
- Planar Microwave Engineering, T.H. Lee, Cambridge (both passive and active circuits)

SCHEDULE*

- Three Lectures per week (Mon. 1-2pm, Tue. 2-3 pm, Thu. 1-2pm all in BA2165)
- One Laboratory every week for a total of 3 Labs/6-sessions
  PART-I: CAD in BA3128: PRA01 Fri. 12-3pm; Starts Sept. 30
  PRA02 Wed. 3-6pm; Starts Sept. 28
  PART-2: TESTING in GB347: PRA01 Fri. 12-3pm; Starts Oct. 14
  PRA02 Wed. 3-6pm; Starts Oct. 12
- One tutorial every week (Thu 3-4pm, BA2145; Starts Sept. 22).

GRADING

Final Exam: 50%
Midterm#1 Exam: 12.5%
Midterm#2 Exam: 12.5%
Laboratory: 25%

A separate final examination will be given to graduate students (ECE1256)

Weekly assignments will not be marked but please do them on your own! Solutions will be posted on BB and discussed in the tutorials.

* Check for future updates