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 (Tue. 1-2 pm BA2195, Wed. 1-2pm BA2195, Fri. 1-2pm BA2195)
- One Laboratory every week for a total of 3 Labs/6-sessions (PART-I: CAD in BA3114 Tue. 3-6pm, Starts Oct. 21; PART-2: TEST in GB347 Tue. 3-6pm GB347, Starts Oct. 28).
- One tutorial every week (Mon. 12-1pm, BA2145; Starts Sept. 15).

GRADING

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

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