

EE3xxx – Microwave Engineering

This course provides the foundation concepts for the following courses Antenna Theory, Microwave Systems Engineering, Radar Engineering and Microwave Remote Sensing.

Course Objectives

- Analyze various design aspects of matching network, filters and resonators
- Develop the skills of using mathematical and electromagnetic tools to calculate the S-parameters of a network
- Use transmission lines to analyse matching network and resonators design
- Solve assignments on working of rectangular and circular waveguide as resonators
- Design power dividers and directional couplers for class project in HFSS

Syllabus

- Microwave network analysis: Impedance and Equivalent Voltages and Currents, Impedance and Admittance Matrices, Reciprocal Networks, Lossless Networks, The Scattering Matrix, Reciprocal Networks and Lossless Networks, Relation to Impedance Matrix, Equivalent Circuits for Two-Port Networks, Application to Thru-Reflect-Line Network Analyzer Calibration, Excitation of Waveguides
- Impedance matching and tuning: Matching with Lumped Elements (L Networks), Analytic Solutions, Smith Chart Solutions, Single-Stub Tuning, Shunt Stubs, Series Stubs, Double-Stub Tuning, The Quarter-Wave Transformer
- Microwave resonators: Series and Parallel Resonant Circuits, Loaded and Unloaded Q, Transmission Line Resonators (Short-Circuited $\lambda/2$ Line and $\lambda/4$ Line, Open-Circuited $\lambda/2$ Line), Rectangular Waveguide Cavity Resonators
- Power dividers and directional couplers: Basic Properties of Dividers and Couplers, Three-Port Networks (T-Junctions), Four-Port Networks (Directional Couplers), The T-Junction Power Divider, Lossless Divider, Resistive Divider, The Wilkinson Power Divider, Waveguide Directional Couplers
- Microwave filters: Filter Design by the Insertion Loss Method, Characterization by Power Loss Ratio, Maximally Flat Low-Pass Filter Prototype, Equal-Ripple Low-Pass Filter Prototype, Linear Phase Low-Pass Filter Prototypes, Filter Transformations, Bandpass and Bandstop Transformations, Filter Implementation, Richards' Transformation, Kuroda's Identities, Impedance and Admittance Inverters; Introduction to coupled line filters

Assignments

- Problems from the text or reference books
- MATLAB and OpenEMS/HFSS based engineering problems

Mark Distribution	
Class Test	5
Quiz 1	10
Quiz 2	10
Assignments	20
Project	10
Final exam	45

Textbooks

Microwave Engineering by David M. Pozar, Sixth edition, published by Pearson Education.

Faculty

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Teaching Assistant

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