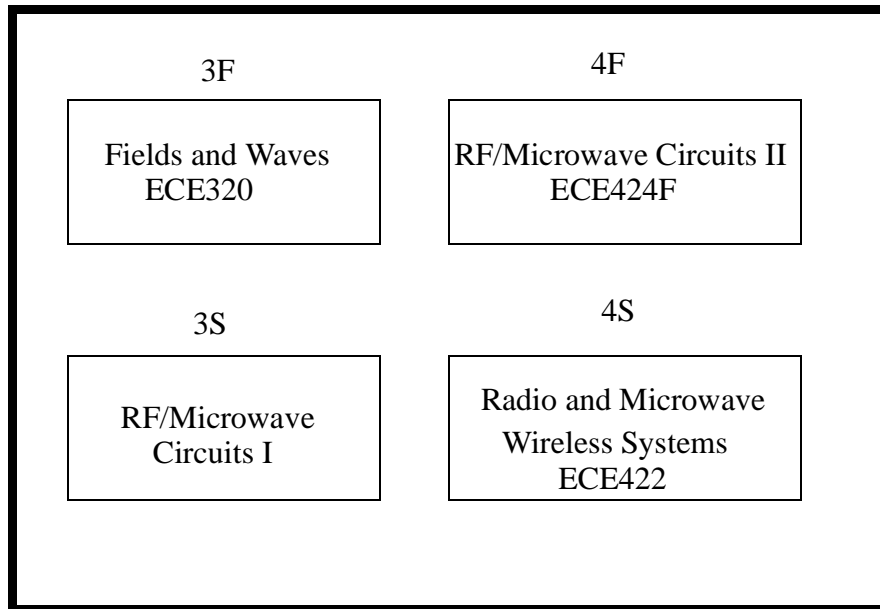


RF/MICROWAVE WIRELESS AREA



Fields and Waves (KERNEL)

ECE320

Waves on transmission lines; The electromagnetics of circuits

Smith chart

Maxwell's equations

Constitutive relations

The wave equation

High bit-rate propagation on chip and on PCB interconnects: reflections, pulse broadening, intersymbol interference; eye diagrams

Propagation of modulated signals on interconnects; phase and group velocity; dispersion

Plane waves

Plane-wave propagation, reflection and refraction, Fresnel coefficients

Parallel-plate waveguide; rectangular waveguide; co-axial cable

Thin film optical waveguides; Optical fibres

Radiation from dipoles; antennas; radio wave links;

Interference and diffraction

RF/MICROWAVE CIRCUITS I

FUNDAMENTALS

The wave equation; Plane waves; Losses in conductors and dielectrics

RF/MICROWAVE TRANSMISSION LINES

The distributed circuit representation of transmission lines

Transient response of transmission lines

Phase and group velocity, dispersion

High-speed digital interconnects

TEM, TE and TM waves

Parallel-plate transmission line, dielectric slab waveguide, co-axial cable

Stripline; Microstrip; Coplanar waveguide

RF/MICROWAVE RESONATORS

Series and parallel resonators; The Q-factor; Coupling to resonators

MATCHING NETWORKS

L and PI matching networks

Single and double stub tuners

RF transformers and baluns

DESIGNING WITH SCATTERING PARAMETERS

The scattering matrix

The scalar and vector network analyzer/theory of calibration

2-ports

3-PORT RF DEVICES

Power combiners/dividers

The Wilkinson divider

Circulators and isolators

4-PORT RF DEVICES

Directional couplers; The 90-degree hybrid; The 180-degree ring-hybrid

COUPLED LINES AND DEVICES

Coupled lines as a four port; Coupled-line directional couplers; The Lange coupler

RF AND MICROWAVE FILTERS

Periodic structures

The insertion loss method

The Kuroda identities

Stepped impedance filters; Coupled-line filters

SAW filters

RF/MICROWAVE CIRCUITS II

INTRODUCTION TO RF RECEIVERS

Modulation; Amplifiers; Mixers; Filters

Superheterodyne receivers; Direct-conversion receivers

DESIGNING WITH S-PARAMETERS

Signal flow graphs; The vector network analyzer; Calibration techniques

NOISE

Signal-to-noise ratio; Noise temperature; Noise figure

Noisy two-ports; Noise in cascaded two-ports

Noise circles

Noise measurements

RF/MICROWAVE TRANSISTORS

Microwave bipolar transistors; Heterojunction bipolar transistor

Microwave FETs

DC biasing techniques

AMPLIFIERS

Maximum gain amplifiers

Stability

The differential amplifier

Low noise amplifiers

Balanced amplifiers

Distributed amplifiers

Power amplifiers

class A, B, C

switching amplifiers: classes E and F

Load Pull measurement techniques

MIXERS

The single-ended diode mixer

Balanced diode mixers; Doubly balanced diode mixers

Image rejection mixers

Gilbert cell

OSCILLATORS

Two-port oscillator design

Negative resistance, Barkhausen criterion

Oscillator Q and output power

Noise in oscillators, Leeson's phase noise model

Injection locking

Radio and Microwave Wireless Systems

ECE422

Antennas

Radiation from elementary dipoles
Patterns and the far field
Directivity, gain, efficiency, polarization
Monopoles and dipoles; patch antennas
Antenna arrays/beam-steering

Wireless Propagation and Links

Friis transmission equation
Diffraction and propagation over obstacles
Multipath propagation in urban environments
Antenna diversity; introduction to smart antennas
Link equation and link budgets
Radio/microwave links

Receivers

Receiver figures of merit (sensitivity, dynamic range, intersymbol interference, intermodulation etc.)
Noise in cascaded systems, noise figure, noise temperature
Heterodyne and homodyne receiver architectures
Image-reject receivers

Wireless Systems

Fixed wireless access
Wireless cellular concept; personal communication systems
Satellite communications
GPS
Radars
Remote sensing and radiometers

