Advanced Nonlinear Microwave Circuit Engineering

ECE 7822

Credit Hours:
3.00 - 3.00

Course Levels:
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Large-signal characterization and modeling of nonlinear RF circuits; power amplifiers; oscillators; modulators; wideband linearization, power efficient design.

Prerequisites and Co-requisites:
Prereq: 5027 or 723.

Course Goals / Objectives:
• Modern RF radios developed for broadband services require nonlinear RF front ends that handle wide bandwidth, operate linearly & are power efficient. These requirements are reviewed & figures of merit such as PARP, CCDF, ACPR & EVM will be defined
• Introduce microwave/RF engineers to modern large-signal characterization, design and linearization techniques which have been developed to address these challenges
• Application to the design and simulation of power amplifiers, oscillators and modulators with power efficiency, linearity and wide bandwidth as a target
**Course Topics:**
- Review of modern communication requirements and associated figure of merits such as PARP, CCDF, ACPR and EVM
- Large-signal vector measurement techniques with LSNAs
- Direct model extraction of transistor from large signal load lines
- Behavioral modeling of power RF amplifiers with memory
- Interactive load-line-based design of power RF amplifiers
- Kurokawa theory of oscillator design and advanced phase-noise theory
- Characterization and linearization of microwave modulators
- Frequency-selective linearization of power RF amplifiers with memory

**Designation:**
Elective