



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Advanced Nonlinear Microwave Circuit Engineering

## ECE 7822

**Credit Hours:**

3.00 - 3.00

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**Course Levels:**

Graduate (5000-8000 level)

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**Course Components:**

Lecture

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**Course Description:**

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

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**Prerequisites and Co-requisites:**

Prereq: 5027 or 723.

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**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
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**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
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**Designation:**

Elective