



# Introduction to RF Systems

## ECE 5022

**Credit Hours:**

3.00

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**Course Levels:**

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

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**Course Components:**

Lecture

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**Course Description:**

Intuitive system design methods to dissect the radio modem in analog & digital domains with emphasis on: a) performance evaluation using hand calculations and simulation, and b) understanding of the interaction between RF components and radio architectures. Topics include: system parameters, propagation & antennas, noise, distortion, modulation & aerial access, phase noise, RF transceivers.

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**Prerequisites and Co-requisites:**

Prereq or concur: 4021 or 5021, or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

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**Course Goals / Objectives:**

- Understand different block-level specifications and impairments, such as S-parameters, gain, bandwidth, noise figure, P1dB, IIP3, IIP2, and phase noise, and how to relate them to performance metrics, such as BER, EVM, sensitivity and selectivity
  - Evaluate the impact of different impairments in radio front-ends on link margin, including path loss and fading, interference, noise, circuit nonlinearity, and phase noise
  - Learn aspects of the digital signal processing chain at both the modulation and demodulation ends
  - Design and simulate (at block level) a full modem including RF, analog and digital components
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**Course Topics:**

- RF Block and System Design Parameters
  - Signal Propagation & Antennas
  - Noise
  - Distortion & Mixers
  - Modulation & Aerial Access
  - Phase Noise
  - Transceiver Architecture & Case Studies
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**Designation:**

Elective