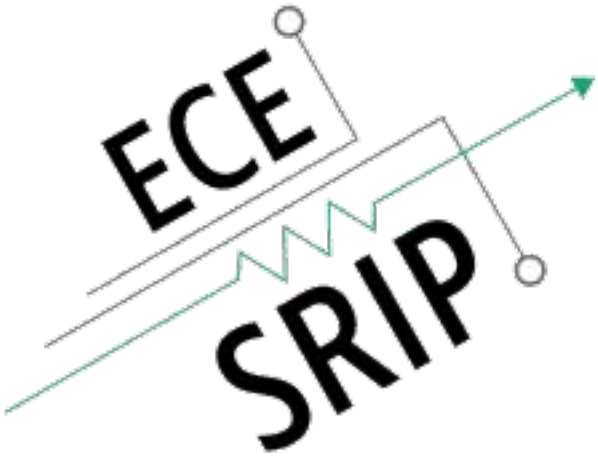


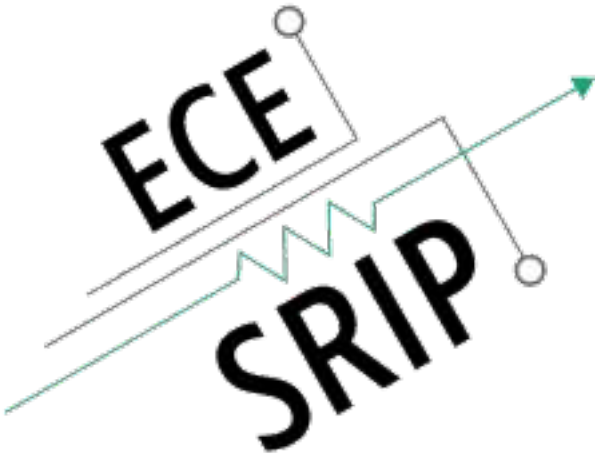
FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
5G Based Position Location System

PROJECT DESCRIPTION
Description: Wireless technologies available today are based on GNSS, Wi-Fi, LTE and UWB. Although moderately accurate and reliable in outdoor environments, GNSS based positioning technologies suffer greatly in urban and indoor environments due to multipath effects and signal blockages. In addition, enemy counter measures, such as jamming and spoofing, limit the reliability of this technology. Wi-Fi based positioning techniques can offer highly accurate measurements, but only in environments with Wi-Fi connectivity. 4G/LTE positioning technologies, those developed as a result of FCC E911 requirements, such as Enhanced-Cell ID, Assisted-GNSS and Observed Time Difference of Arrival are all too inaccurate. Lastly, UWB positioning, although very accurate, has a limited range due to restrictions on output power and requires deployment of significant infrastructure unlikely to happen over next decade due to the commercial realities. Location awareness is a key feature of 5G NR (new radio) and 3GPP release 16 holds the promise for high precision localization by exploiting the wider bandwidth and MIMO capabilities. Over the next decade, releases 17-21 are expected to improve upon the basic features introduced in release 16. This project will explore position location based on 5G.

INTERNS NEEDED
1 BS and 2 MS

PREREQUISITES
Required Qualifications:
1. BS students must have GPA of 3.6 or higher
2. Experience in building hardware and RF measurements is preferred



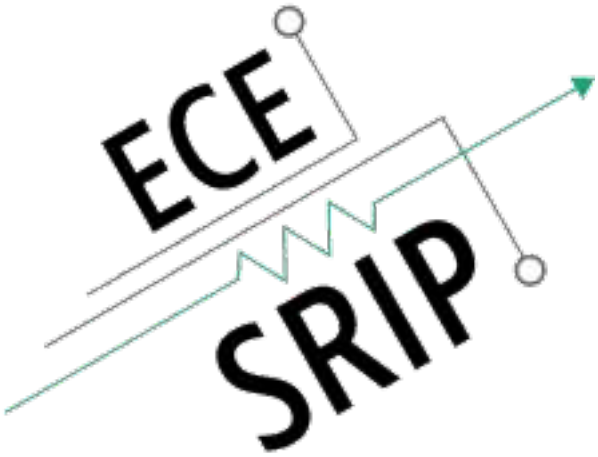
FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
Design of Bias Circuit for Novel Negative Capacitance Field Effect Transistor (NCFET)

PROJECT DESCRIPTION
Description: Negative-capacitance field-effect transistors (NCFETs) realized by stacking ferroelectric material on the top of the conventional gate oxides have recently emerged as strong candidates to continue supply voltage scaling as transistors approach their physical scaling limit. The use of ferroelectrics enables NCFETs to break the subthreshold slope (SS) barrier of 60 mV/decade set by the Boltzmann statistics and to provide a high ON-current. Unfortunately, the existing NCFET structure exhibit high input capacitance and finite ρ limiting their potential in RF/mmWave applications [1], [2]. An alternative NCFET structure is being investigated for application in RF/mmWave applications. This new NCFET structure is inherently unstable and requires novel biasing techniques to benefit from the high fT offered by the new NCFET structure. The goal of this project is to design the novel bias circuit to keep the new NCFET structure in stable operation. Design, layout, LPE and tapeout are expected to be completed in one years.), Austin, TX, USA, 2017, pp. 1–8.

INTERNS NEEDED
3 MS

PREREQUISITES
Required Qualifications:
1. MS student with good GPA. A- or better grade in ECE164 and 264A courses.
2. Experience with Cadence (design, layout, LPE and tapeout) is preferred



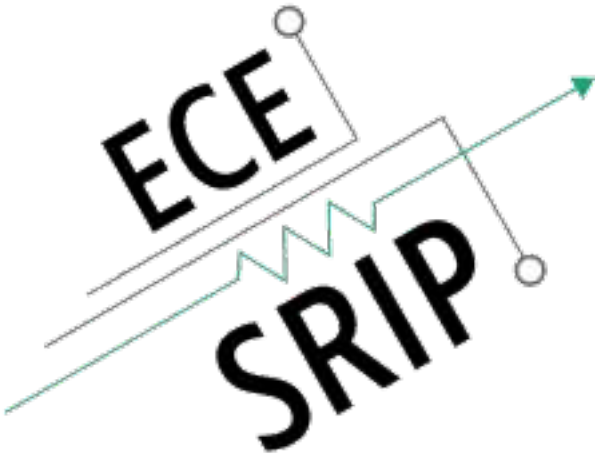
FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
N-Path Filter

PROJECT DESCRIPTION
Description: The tunable center frequency and bandwidth of N-path filters makes them an ideal choice for compact software-defined radios [1], [2]. These filters are typically assumed to be driven by a source having a 50-Ω impedance and a load impedance that is modeled as a capacitor. However, impedances on the source side and the load side of an N-path filter may vary for multiple reasons. For example, environmental effects and user interaction with the antenna can cause a deviation in source impedance from the standard 50 Ω and corresponding voltage-standing-wave-ratio (VSWR) of 1:1 to a VSWR of 2:1 [3]. In addition, the frequency response of the load impedance (also called the baseband impedance) can be affected by the harmonic response of the passive and active loads used in N-path filter design. Such impedance variations can result in significant deviations of the center frequency and bandwidth of N-path filters. An alternative approach to derive analytical forms for the HTFs of an N-path filter with arbitrary source and baseband impedance has been recently developed. In this project, the student will design an N-path filter to validate the theoretical expressions and extend the work to develop simplified expression for special cases.

INTERNS NEEDED
3 MS

PREREQUISITES
Required Qualifications:
1. MS student with good GPA. A- or better grade in ECE164 and 264A courses.
2. Experience with Cadence (design, layout, LPE and tapeout) is preferred



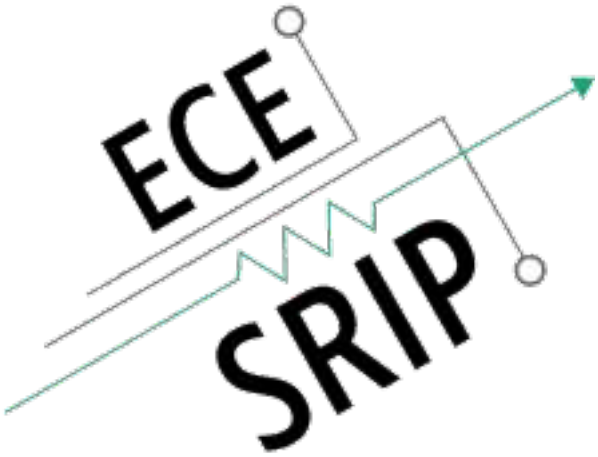
FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
Fast-locking PLL design

PROJECT DESCRIPTION
Description: Fast spectrum scanning receivers are desirable in many applications such as cognitive radios. A key component to enable fast spectrum scanning is a fast-locking PLL. This project will involving reviewing the state of the art literature and identifying a suitable architecture for fast-locking PLL [1, 2] and proposing enhancements to improve the lock time of the PLL.

INTERNS NEEDED
3 MS

PREREQUISITES
Required Qualifications:
1. MS student with good GPA. A- or better grade in ECE164 and 264A courses.
2. Experience with Cadence (design, layout, LPE and tapeout) is preferred



FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
Impact of FR1 5G NR Jammers on UWB System

PROJECT DESCRIPTION
Description: The newly released FR1 5G NR licensed bands (n77, n78 n79) overlap with the 3.2-5GHz portion of the UWB band and are expected to have operating bandwidth of 100-200MHz to meet the rising demand for high data rates. In a recent publication, we have shown that FR1 5G NR jammers significantly degrade the position location accuracy of ultra-wideband (UWB) system [1]. However, the analysis based on Cramer-Rao bound does not match the measured results. In this project, we plan to do more detailed measurements, simulate the system and develop the analysis and theory to explain the results.

INTERNS NEEDED
1 BS or MS

PREREQUISITES
Required Qualifications:
1. BS or MS student must have good GPA (3.6 or higher)
2. Experience in building hardware and RF measurements is preferred
3. Experience with Matlab