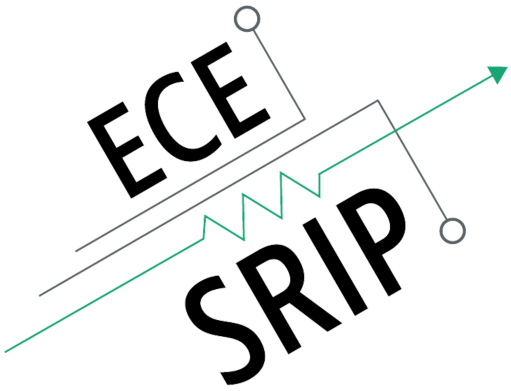

FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
5G mmWave IC Design

PROJECT DESCRIPTION
The next generation cellular wireless technology, 5G NR, started getting deployed in 2020. 5G NR is expected to be deployed in two operating bands, FR1 (410 - 7125MHz) and FR2 (24.25 - 52.6GHz). For successful deployment of FR2, commonly referred to as 5G mmWave, several drawbacks need to be overcome – atmospheric absorption, scattering, non-line of sight issues, etc. This is accomplished using Phased Arrays with Wide Bandwidths, Beamforming, Small Cell, and Massive MIMO. Unfortunately, the massive number of parallel Receivers and Transmitters required in the mmWave Phased Arrays consumes significant power. Consequently, significant effort is underway to reduce the power consumption of the various blocks in the mmWave 5G Receiver / Transmitter chain. In this project, each student will design one of the mmWave 5G Receiver / Transmitter chain blocks.

This project can accommodate both remote and in-person students.

INTERNS NEEDED
4 Students

PREREQUISITES
- ECE166 & ECE164.
- Student must be scheduled to take the ECE265 course sequence. Prior experience in using Cadence, publications in IEEE, and/or prior industry experience in analog/RF IC design is an asset.

FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
Wireless positioning, MEMS, and Drones

PROJECT DESCRIPTION
Study of aerodynamics of boomerangs using wireless positioning, MEMS, and Drones

Boomerang is a simple and ingenious device invented by man thousands of years ago. Despite the simplicity of the device, the flight dynamics of a boomerang are rather complex as it experiences significant translational and rotational velocity. In our recent publications, we extended Vassberg's work [1] on the flight dynamics of boomerangs [2, 3 & 4]. Our research group is in the process of expanding on our earlier research to study the impact of joint angle, dihedral, on the flight trajectory of the boomerang. In our study, the flight trajectory of the boomerang will be measured using an ultra-wideband (UWB) wireless position location system, Micro-electromechanical systems (MEMS), and Drones.

This project can accommodate both remote and in-person students.

INTERNS NEEDED
4 Students

PREREQUISITES
- Highly motivated 2nd, 3rd, and 4th-year students with a GPA of >3.5.

References:
[1] John Vassberg, "Boomerang Flight Dynamics," 30th AIAA Applied Aerodynamics Conference, 2012.
[2] P. Gudem, M. Schütz, K. Holland, "Flight Dynamics of Boomerangs: Impact of reversal of airflow and reversal of angle of attack," AIAA Aviation Forum and Exposition, 2019.
[3] P. Gudem, M. Laslett, G. Carfano, M. Schütz, K. Holland and H. Murguia, "Flight Dynamics of Boomerangs: Impact of Drag Force and Drag Torque", AIAA Aviation Forum and Exposition, 2020.
[4] J. Tahmassebpur, M. Laslett, M. Schultz, P. Gudem, "Wind Tunnel Measurements of Non-Dimensional Lift Coefficient of a Boomerang and Comparison to Theory," AIAA Aviation Forum and Exposition, 2021.