

Department of Electrical and Computer Engineering



TEXAS TECH UNIVERSITY

Edward E. Whitacre Jr.
College of Engineering™

Spring 2012 Seminar Series

Seminar Title: **On-Chip Calibration and Performance Monitoring of IC Circuits**

Time: March 9th, 2012, 3:00 - 4:00 PM

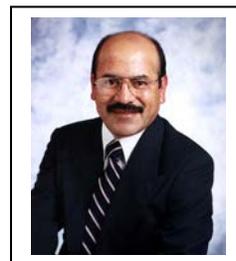
Location: Lankford Lab ECE 101

Speaker:

Jose Silva-Martinez

Professor

Dept. of Electrical and Computer Engineering,
Texas A&M University, College Station



Abstract:

The calibration challenges and approaches for analog RF circuits will be presented from a system-level perspective. In emerging “self-healing” strategies for integrated transceivers, the digital signal processor typically controls the corrective actions. Therefore, it is critical to identify and implement digitally controllable tuning features for the analog RF blocks. The focus will be on the discussion of circuit-level examples with on-chip “tuning knobs” in the analog front-end of transceivers that are aligned with system-level calibration approaches; these techniques are relevant for the cases the existing baseband digital calibration techniques are not effective. Mostly digital monitoring/calibration techniques for high-performance ADCs will be covered as well.

Another aspect to be addressed is that block-level performance measurement and fault identification capabilities in the RF front-end are vital to improve the effectiveness of the calibration schemes, mainly for the parameters that can not be calibrated in the DSP and requires calibration of the RF blocks. Towards this end, the use of on-chip differential temperature sensors will be described. It will be shown how RF power and linearity characteristics can be extracted from thermal monitoring without electrical connections to the circuit under test. The approach makes use of thermal coupling through the semiconductor substrate. This coupling generates a change in temperature close to the circuit under test that depends on its electrical power dissipation, including down-converted RF power components. Specifically, measurement results will be presented from the 1-dB compression point characterization of a low-noise amplifier by monitoring the low-frequency output voltage of an on-chip temperature sensor fabricated in a standard CMOS technology. Monitoring and calibration techniques for RF mixers and power amplifiers will be discussed as well.

Speaker Bio:

Dr. Silva-Martinez is currently the Texas Instruments Professor at the Electrical and Computer Engineering Department at Texas A&M University in College Station, Texas. He received the Ph.D. degree from the Katholieke Universiteit Leuven, Leuven, Belgium in 1992. During his almost 25 years of teaching and research experience at the university level, he developed several courses in the fields of electronics, circuit analysis, and the design of integrated systems. He has published over 92 journal papers, 150 conference papers, 2 books, and 11 book chapters. His current fields of research are in the design and fabrication of integrated circuits for communication and biomedical applications. He was the recipient of the 2005 Outstanding Professor Award in the Electrical and Computer Engineering Department at TAMU. He is co-author of the papers that received 2003 IEEE RF-IC and 2011 IEEE MWCAS Best Student Paper Awards, and recipient of the 1990 IEEE ESSCIRC Best Paper Award. He is an IEEE-Fellow.

