



THE ELECTRICAL & COMPUTER ENGINEERING PROGRAM PRESENTS

# High-Resolution RF-to-Digital Converters for Broadband Communication Systems

*Jose Silva-Martinez*

Wednesday, May 19

12.00 – 1.00 p.m. light lunch will be served

Lecture Hall 144

A major requirement for the next-generation of wireless devices and base stations is a single chip set with minimum off-chip components that can support multiple standards, e.g. internet access, voice, data, and DTV, usually located in a broad RF spectrum. The heterodyne and super heterodyne radios currently used employ mixing and filtering operations to translate the desired narrow-band RF channel to base-band. However, the mixing of broadband signals with a carrier that does not satisfy the Nyquist criterion generates interference between channels, degrading the quality of the signal. In the proposed approach, the signal is digitized right after leaving the antenna, minimizing the use of noisy and power hungry analog circuitry. This technology enables the use of a single wireless device to support a wide range of services and standards. The architecture consists of a highly linear, variable-gain low-noise amplifier and a high-resolution programmable RF-to-digital converter. Dr. Silva-Martinez research group is developing a 2-6 GHz prototype to achieve over 10 bits resolution when measured in a bandwidth of 50 MHz. The architecture can be digitally reprogrammed to select the desired service. The architecture is fully-compatible with current and future devices such as software and cognitive radios. As a proof of concept, a 6th-order band-pass analog-to-digital converter with 10 MHz bandwidth and 200MHz operational frequency has been designed and experimentally verified. The architecture performs 68.4dB and 62.3dB signal to distortion-plus-noise ratio when measured in 10MHz and 20MHz bandwidth, respectively, and -73.5dB intermodulation distortion.

Jose Silva-Martinez got his Ph.D. degree from the Katholieke Univesiteit Leuven, Leuven Belgium in 1992. He pioneered the graduate program on Opto-Electronics in 1992 at the Autonomous University of Puebla, Mexico. In 1993, he joined the Electronics Department, INAOE, Mexico, and from 1995-1998 was the Head of the Electronics Department; He was a co-founder of the Ph.D. program on Electronics in 1993. He is currently with the Department of Electrical and Computer Engineering Texas A&M University, at College Station, where he was recently promoted to the position of Professor. He has published over 85 and 140 Journal and conference papers, respectively, 1 book and 9 book chapters. His current field of research is the design and fabrication of integrated circuits for communication, instrumentation and biomedical applications.

Dr. Silva-Martinez has served as IEEE CASS Vice-President Region-9 (1997-1998), and as Associate Editor for IEEE TCAS part-II from 1997-1998 and 2002- 2003, Associate Editor of IEEE TCAS Part-I 2004-2005 and 2007-2009, and currently serves in the board of editors of other 6 major journals; he is involved in the technical organization of a number of IEEE conferences. He was the recipient of the 2005 Outstanding Professor Award by the ECE Department, Texas A&M University, co-author of the paper that got the RF-IC 2005 Best student paper award; Co-advisor in Testing systems of the student that got the First place of the IEEE TTTC PhD Thesis Award 2005, and recipient of the 1990 European Solid-State Circuits Conference Best Paper Award. He is the co-author of the IEEE TCAS-I paper that has been consistently within the top 3 most downloaded papers of the journal during the period 2004-2009. He is an IEEE Fellow.

<http://amesp02.tamu.edu/~jsilva>



**For more information contact:**

Noha Ezzat

313E Texas A&M Engineering Building

tel. +974.423.0152 fax +974.423.0064

[noha.ezzat@qatar.tamu.edu](mailto:noha.ezzat@qatar.tamu.edu)

[ecen.qatar.tamu.edu](http://ecen.qatar.tamu.edu)

