

**Electrical and Computer Engineering
Special Seminar on Novel Nanodevices**

**Monday, April 16th 2012
9:30 – 10:30 AM
CSB 209**

**Professor Martin Margala
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University of Massachusetts - Lowell**

**Second Generation of Ballistic Deflection Transistor Technology - Alternative to
Low-Voltage High Speed Circuit Design**

Abstract:

The talk will present the latest developments in Ballistic Deflection Transistor (BDT) Technology as it builds momentum in low voltage high frequency circuit design. The utilization of BDTs is investigated for the realization of the complete family of logic functions. BDT performance is optimized through its structural modification which is followed by the Monte Carlo simulations for 2-input logic gate functionalities at room temperature. BDT is a quasi-ballistic planar device based on InGaAs/InAlAs/InP hetero-layer. The faster non-scattering transport obtained in the two dimensional electron gas (2DEG) layer facilitates smaller transit time and high performance needed for high speed circuitry. Next, first successful integration of a high-k dielectric, Al₂O₃, with III-V semiconductors in BDTs will be presented. The BDT transfer characteristic shows a strong dependence on the dielectric permittivity of the material filling the etched trenches. The transconductance of the BDTs is enhanced and shifted to lower gate bias when the Al₂O₃ is deposited in the trenches. Moreover, the ratio between output and leakage currents was also enhanced. Finally, the talk will present the new efforts in adopting the BDT technology in graphene. 3G BDT is coming.