

*Distinguished Seminar*  
**Negative Capacitance**

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University of California, Berkeley

**10:30 AM, Thursday, October 17, 2019**  
**WANG Hall Room 1004**

The physics of ordered and correlated systems allows for fundamental improvement of energy consumption, going beyond what is possible with conventional materials. One such example is the class of materials with polar distortion such as a (anti)ferroelectric, where thermodynamics dictate that charge can be switched with much lower energy compared to conventional dielectrics. In these materials the internal order leads to a state of negative capacitance, which results in a boost of internal electric fields and charge. This boost could be exploited for reducing energy dissipation in electronics. In this talk, I shall discuss our current understanding of negative capacitance derived from experimental demonstration of steady state negative capacitance, which allows one to access an otherwise forbidden part of the energy landscape in ferroelectric materials. We shall further discuss the integration of negative capacitance into advanced transistors, and its potential impact on next generation computing hardware.

S. Salahuddin is the TSMC Distinguished Professor of Electrical Engineering and Computer Sciences at the University of California Berkeley. His work has focused mostly on conceptualization and exploration of novel device physics for low power electronic and spintronic devices. Salahuddin has received the Presidential Early Career Award for Scientist and Engineers (PECASE). Salahuddin also received a number of other awards including the NSF CAREER award, the IEEE Nanotechnology Early Career Award, the Young Investigator Awards from (AFOSR) and (ARO), and the IEEE George E Smith Award. Salahuddin is a co-director of the Berkeley Device Modeling Center (BDMC) and Berkeley Center for Negative Capacitance Transistors (BCNCT). Salahuddin is also a co-director of ASCENT, one of the six centers of the JUMP initiative sponsored by SRC/DARPA. He served on the editorial board of IEEE Electron Devices Letters (2013-16) and was the chair the IEEE Electron Devices Society committee on Nanotechnology (2014-16). Salahuddin is a Fellow of the IEEE and the APS.

