

# ECE DISTINGUISHED LECTURE



Applied Electromagnetics &  
RF Circuits

Computer Vision

Control Systems

Embedded Systems

Integrated Circuits & VLSI

MEMS & Microsystems

Network, Communication,  
& Information Systems

Optics & Photonics

Power & Energy

Robotics

Signal & Image Processing  
& Machine Learning

Solid State &  
Nanotechnology

## *Thank God for GaN!*

Tuesday, April 9, 2019

10:30 am – 11:30 am | 1200 EECS

**ABSTRACT** — Progress and enhancing the quality of life for all people requires energy consumption; a form of energy transduction if you will where energy is converted to quality of life. This engine also seems to have a Carnot efficiency which has to be made as high as possible as we all want the maximum number of people on the planet to have a higher quality of life. Collecting and using large amounts of data wisely, modifying the energy generation mix, enhancing the control of our grid, expanding the Internet of Things and the call to bring essential human requirements — such as light and agriculture — into the 21st century all force us to think about how we achieve our goals with minimal waste. Underlying many aspects of those new technologies and energy-saving efforts is gallium nitride (GaN), a compound with unique and valuable electronic properties. For decades Professor Mishra has focused his research primarily on the development of GaN materials and devices for electronics while contributing to opto-electronics such as optical data storage, semiconductor lasers and - last but not least - white LEDs pioneered by Prof Nakamura, which have revolutionized lighting throughout the world. The development of the blue LED sparked an excitement about the possibilities that GaN offers that has been relentless and exhilarating. It's been like kayaking the class 5 rapids of semiconductors. The applications have spread beyond general lighting to lasers, horticulture and electronics to name a few. Hybrid and electric vehicles to data servers to solar inverters, to robotics to gaming and last but not the least, communications across a large band of interest (from RADAR to 5G) are all being served by GaN. Hang on there for the ride....

**BIO** — Umesh K. Mishra is a Distinguished Professor of the University of California and the Donald W. Whittier Professor of Electrical and Computer Engineering at UC Santa Barbara. He received his B.Tech from the Indian Institute of Technology in Kanpur India, his M.S from Lehigh University in Bethlehem, PA., and his PhD in 1984 from Cornell University in Ithaca, NY. He has supervised more than 65 PhD theses with over 40 of them in the field of Gallium Nitride (GaN) materials and devices. He has more than 1000 papers with a Web of Science h index of 88 and was included in the Thomson Reuters 2014 list of Most Cited Researchers. He co-founded the first start-up in the world to commercialize RF GaN transistors and LEDs in 1996 (Nitres) which was acquired by CREE in 2000. He co-founded Transphorm in 2007 which has commercialized GaN-on-Si transistors for power conversion where he currently serves as Chairman and CTO. He has received numerous awards including the IEEE MTT-S Distinguished Educator Award, IEEE David Sarnoff Award, the ISCS Welker Medal and the ISCS Quantum Device Award for his contributions to the development and commercialization of GaN electronics. He is a Fellow of the IEEE, an International Fellow of the Japanese Society of Applied Physics, Fellow of the National Academy of Inventors and a Member of the National Academy of Engineering. Most importantly, his students are doing extremely well and emerging as leaders in their own right!



**Umesh  
Mishra**

**Professor  
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