Nanoscale Wireless Networking: Opportunities, Challenges, and Recent Advances

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Overview

Advancement in nanotechnology has made it possible to manufacture sensors, circuits and devices measuring only nanometers in size. This development is creating an extraordinary opportunity to observe, interact, and optimize physical systems from the very bottom. Wireless communication and networking at nanoscale, however, faces new challenges not encountered in conventional sensor networks. For example, nanoscale antennae call for wireless communication in the Terahertz band, which encounters new path loss and noise phenomena posing significant challenges for many target applications of such networking. Nanoscale computing and communication is a new and rapidly growing field of research promoting collaboration between wireless networking, nanotechnology, and other fundamental disciplines.

Objective of this short term course is to present the opportunities, challenges, and a survey of recent advancements of this new and growing inter-disciplinary field. Various aspects of the subject will be covered as part of the course with a proper blend of theory, simulation and experimentation. The primary objectives of the course are as follows:

- Exposing participants to various applications of nanoscale networking including medical, chemical, and agricultural applications.
- Exposing the participants to various energy storage, harvesting and consumptions models in nanoscale devices including nonbatteries, nanogenerators, and nontransreceivers.
- To provide novel material based antenna technology as well as new propagation and noise models and tools used to estimate path loss for nanoscale communication in different environments.
- To provide the knowledge of available tools for simulating nanoscale communication environments.
- To provide overview of communication protocols such as modulation and coding technique, power control and routing for nanoscale communications.
- Giving emerging research directions and open problems in nanoscale networking.

Modules	A: Introduction nanoscale networking and applications:	December 19, 2016
	B: Energy storage and harvesting in nanoscale device:	December 20, 2016
	C: Antenna, propagation model in nanoscale communication:	December 21, 2016
	D: Modulation and coding for nanoscale communication:	December 22, 2016
	E: MAC and routing for nanoscale communication:	December 23-24, 2016
	Number of participants for the course will be limited to fifty. All modules are compulsory to attend	
You Should Attend If…	▪ You are an executive, engineer and researcher from industry and government organizations, including R&D laboratories interested in learning of nanoscale networking and communication module.	
	▪ You are a student at all levels (B.Tech/M.Sc/M.Tech/Ph.D) or Faculty from the reputed academic institutions interested in pursuing research in communications and networking.	
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $200** **Industry/ Research Organizations: Rs. 8000/-** **Academic Institutions: Rs. 4000/- (Faculty) & Rs. 1,000/-(Student)** **(For SC/ST students 50% fee is waived)** The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage and Internet facility.	

The Faculty

Prof. Mahbub Hassan is a Full Professor in the School of Computer Science and Engineering, the University of New South Wales, Sydney, Australia. He is a Distinguished Lecturer of IEEE (COMSOC) for 2013 to 2016. He delivered keynote and invited speeches at several international conferences and worked as Visiting Professor at Osaka University and University of Nantes. He was a tutorial speaker at IEEE WPMC 2014, IEEE ICC 2012, and IEEE VTC 2011. He is currently an Editor of IEEE Communications Surveys and Tutorial and has previously served as Guest Editor for Elsevier Nano Communications Network, IEEE Network and IEEE Communications Magazine. He has served in TPC and organizing committee of numerous international conferences and currently serving in the TPC of the newly established ACM NANOCOM conference. He has co-authored three books, one US patent, and over 150 refereed articles. Professor Hassan has earned a PhD from Monash University, Australia, and an MSc from University of Victoria, Canada, both in Computer Science.

Dr. Trilochan Panigrahi is an Assistant Professor of Electronics and Communication Engineering at National Institute of Technology Goa. He was a visiting scholar at the University of Edinburgh, UK for nine months during his PhD time. He published more than 30 journal and conference articles in the area of wireless sensor network. His research interest includes distributed signal processing in wireless sensor network, robust estimation techniques and distributed source localization.

Dr. Ankit Dubey received the B.E. degree in electronics and telecommunication engineering from the Chhattisgarh Swami Vivekanand Technical University, Bhilai, India, in 2009, and the Ph.D. degree in electrical engineering from the Indian Institute of Technology, Delhi, India, in 2014. During his Ph.D., he visited Communications Group under the supervision of Prof. Rober Schober at the University of British Columbia, Vancouver, Canada as a visiting research scholar. He was a research fellow with Prof. Ranjan K. Mallik at the IIT Delhi from July 2014 to December 2014. Since December 2014, he has been with the faculty of the Department of Electronics and Communication Engineering, National Institute of Technology, Goa, India, where he is currently an Assistant Professor. His research interests are in diversity combining, multi-hop transmission, and physical layer security for power line and wireless communications.

Location:

Department of Electronics and Communication Engineering National Institute of Technology Goa Farmagudi, Ponda, Goa-403401, India

Course Duration:

One Week: December 19-24, 2016

Course Coordinators:

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Course Registration Link:

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http://www.nitgoa.ac.in/gian/