



**The Information Science & Technology Center**

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**Colorado State University's  
Information Science and Technology Center (ISTeC)  
presents two lectures by**



**Ishfaq Ahmad**

Professor of Computer Science  
and Engineering,  
University of Texas at Arlington

**ISTeC Distinguished Lecture  
in conjunction with the  
Electrical and Computer Engineering Department and  
Computer Science Department Seminar Series**

# **“Research Challenges in Green Computing, and Some Solutions”**

**Monday, April 29, 2013**

**Reception: 10:30 a.m.**

**Lecture: 11:00 – 12:00 noon**

**Location: Computer Science Building, Room 130**



**Electrical and Computer Engineering Dept. and Computer Science Dept.  
Special Seminar *Sponsored by ISTeC***

# **“New Optimization Techniques in Performance-Energy- Temperature Optimized Parallel Computing”**

**Monday, April 29, 2013**

**Lecture: 3:00 p.m. – 4:00 p.m.**

**Location: Lory Student Center, Room 208**

## ABSTRACTS

### “Research Challenges in Green Computing, and Some Solutions”

Energy is one of the most valuable and scarce resources available to humanity, a significant portion of which is now being consumed to power up computers and their accessories. In particular, high-performance parallel and distributed computing systems, including data centers, supercomputers, clusters, real-time systems, embedded architectures, and grids not only consume considerable amounts of power but also require extensive air-conditioning. The explosive growth in computing is leading to rapidly increasing consumption of precious natural resources such as oil and coal, strengthening the looming danger of an energy shortage. The conversion of these resources to electricity results in carbon emissions that can negatively affect the environment, a threat that is continually escalating. However, energy saving usually comes at the expense of performance. Power-aware “green” computing requires a comprehensive and multi-disciplinary approach that involves myriad research challenges. In this talk, we give an overview of various research challenges encountered in green or energy-efficient computing. We also present our research activities pertaining to various aspect of energy and performance optimization in parallel and distributed computing environments. We propose multi-objective optimized scheduling algorithms and tools that can save energy while ensuring performance.

### “New Optimization Techniques in Performance-Energy-Temperature Optimized Parallel Computing”

The phenomenal growth in computing activity and the rising concern for energy conservation have made energy efficiency in computers a technological issue of paramount importance. Cutting-edge massive multicore processor technology continues to push the growth of computing activity for myriad computing systems, ranging from embedded systems to supercomputing systems, making it even more urgent to address energy efficiency. Temperature control is also essential for lower cooling costs, and ensuring lifespan, reliability and performance. We present a dynamic scheduling scheme for allocating tasks to multicore processors taking into account performance ( $P$ ), energy ( $E$ ), temperature ( $T$ ) and their tradeoffs. Our scheme includes a novel multi-level online optimization using dynamic voltage scaling. Using genetic evolution techniques, the proposed scheduling mechanism evolves together with the application execution, preserving partial solutions and making only the necessary modifications along the time axis.

## SPEAKER BIOGRAPHY

**Ishfaq Ahmad** (<http://ranger.uta.edu/~iahmad>) received a B.Sc. degree in Electrical Engineering from the University of Engineering and Technology, Pakistan, in 1985, and an MS degree in Computer Engineering and a Ph.D. degree in Computer Science from Syracuse University, New York, U.S.A., in 1987 and 1992, respectively. Since 2002, he is a professor of Computer Science and Engineering at the University of Texas at Arlington (UTA). Prior to that, he was an associate professor of computer science at the Hong Kong University of Science and Technology. His research focus is on the broader areas of parallel and distributed computing systems and their applications, optimization algorithms, multimedia systems, video compression, and energy-aware green computing. Dr. Ahmad has received numerous research awards, including three best paper awards at leading conferences and 2007 best paper award for IEEE Transactions on Circuits and Systems for Video Technology, IEEE Service Appreciation Award, and 2008 Outstanding Area Editor Award from the IEEE Transactions on Circuits and Systems for Video Technology. His current research is funded by the U.S. Department of Justice, National Science Foundation, SRC, Department of Education, and several companies in the U.S. He is the Co-founding Editor-in-Chief of the new Journal, Sustainable Computing: Informatics and Systems, and co-founder of the International Green Computing Conference (IGCC). In addition, he is an editor of IEEE Transactions on Parallel and Distributed Systems, and Hindawi Journal of Electrical and Computer Engineering. In the past, he has served on the editorial boards of the Journal of Parallel and Distributed Computing, IEEE Transactions on Circuits and Systems for Video Technology, and IEEE Transactions on Multimedia. He is a Fellow of the IEEE.

To arrange a meeting with the speaker, please contact **Prof. H. J. Siegel** at [HJ@colostate.edu](mailto:HJ@colostate.edu).

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