

# SEMINAR NOTICE

Department of Electrical and Systems Engineering

## *A Formulation and Theory for Delay Guarantees in Wireless Networks*

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**Abstract:** Delay guarantees have been problematic in networking. The usual focus of theory is only on providing throughput guarantees. Yet, wireless networks will increasingly need to support applications requiring such guarantees, e.g., voice-over-IP, interactive video, and control over networks. We propose a theoretical framework for addressing the problem of delay guarantees in wireless networks that incorporates three key issues – delay, throughput, and channel reliability – in the specification of quality of service. A somewhat surprising necessary and sufficient condition characterizes when the quality of service requirements of a given set of nodes can be met. It can be checked in nearly linear time, providing a tractable admission control algorithm. Further, there are easily implementable scheduling policies that are feasibility optimal in the sense that they can meet the demands of every feasible set of nodes. The theory can be extended to more general arrival patterns and fading processes, and can also be cast in a utility maximization framework for delay guarantees. [Joint work with I-Hong Hou and V. Borkar]

Host: Hiro Mukai

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Bryan Hall, Room 305

**Bio:** P. R. Kumar obtained his B. Tech. degree in Electrical Engineering (Electronics) from I.I.T. Madras in 1973, and the M.S. and D.Sc. degrees in Systems Science and Mathematics from Washington University, St. Louis, in 1975 and 1977, respectively. From 1977-84 he was a faculty member in the Department of Mathematics at the University of Maryland Baltimore County. Since 1985 he has been at the University of Illinois, Urbana-Champaign, where he is currently Franklin W. Woeltge Professor of Electrical and Computer Engineering, Research Professor in the Coordinated Science Laboratory, Research professor in the Information Trust Institute, and Affiliate Professor of the Department of Computer Science. He has worked on problems in game theory, adaptive control, stochastic systems, simulated annealing, neural networks, machine learning, queueing networks, manufacturing systems, scheduling, and wafer fabrication plants. His current research interests are in wireless networks, sensor networks, and networked embedded control systems. He has received the Donald P. Eckman Award of the American Automatic Control Council, the IEEE Field Award in Control Systems, and the Fred W. Ellersick Prize of the IEEE Communications Society. He is a Fellow of the IEEE, and member of the US National Academy of Engineering. He was awarded an honorary doctorate (Doctor of Science, Honoris Causa) by the Swiss Federal Institute of Technology (Eidgenossische Technische Hochschule), Zurich in 2008, and is a Guest Chair Professor at Tsinghua University, Beijing.