Digital Communication Networks
Course: 6.20s Date: August 2-6
2004 Tuition: $2,500

MIT Summer Session

Outline of the Program

The rapid evolution of wireless and optical fiber communication has created almost limitless opportunities for new digital networks of greatly enhanced capabilities. The networks of today, both wide area and local, have capacities and functionalities many orders of magnitude above those of a few years ago, and these capacities are expected to continue increasing at a rapid rate. The application requirements for networks are changing as rapidly as the technology. Networks must provide integrated service for mobile services, for high-resolution images and graphics, video, voice, and for conventional data. These evolving networks appear to have almost nothing in common with the data networks of the last 20 years, but in fact, many of the underlying principles are the same. Program 6.20s is designed both to provide a fundamental understanding of these common principles and to provide insights into new principles required for present day and future networks.

The primary focus of the program is on communication sub-networks rather than the computers, peripherals, and users accessing a given network. In terms of layered architectures, this means that the focus is on the transport, network, data link, and physical layers. The course explains how these layers operate and interact and how the major functions of each layer are affected by network speed and user requirements.

The course is balanced between descriptive material, illustrating the operation and the limitations of current networks (e.g. the Internet, Ethernet, ATM, 802.11, etc.) and analysis, showing how the performance of networks can be evaluated and improved, and showing how new technologies can be advantageously used. The descriptive material is used to illustrate the underlying concepts, and the analytical material is used to provide a deeper and more precise understanding of the concepts. The course should be attractive to practicing engineers and researchers who want to understand the interface between theory and practice, and would like to apply advanced design and performance evaluation techniques to future digital networks.

Expected Background

The program is designed for people with an engineering background who are interested in the design and use of digital networks. Some knowledge of one or more of the following areas would be helpful to attendees but is neither assumed nor expected: probability, algorithms, elementary queueing theory, digital communication, and optimization.

ABOUT THE PRESENTERS

Muriel Médard is a Harold E. and Esther Edgerton Associate Professor in the Electrical Engineering and Computer Science Department at MIT and a member of the Laboratory for Information and Decision Systems. She was previously Assistant Professor at the Electrical and Computer Engineering Department and a member of the Coordinated Science Laboratory at the University of Illinois Urbana-Champaign. From 1995 to 1998 she was a Staff Member at MIT Lincoln Laboratory in the Optical Communications and the Advanced Networking Groups. Professor MÕdard received a B.S. degree in EECS and one in Mathematics in 1989, a B.S. degree in Humanities in 1990, a M.S. degree in EE 1991, and a Sc.D. degree in EE in 1995, all from the Massachusetts Institute of Technology, Cambridge, MA. She serves as an Associate Editor for the Optical Communications and Networking Series of the IEEE Journal on Selected Areas in Communications and as an Associate Editor in Communications for the IEEE Transactions on Information Theory. She has served as a Guest Editor for the IEEE Journal of Lightwave Technology and as an Associate Editor for the Optical Society of America's Journal of Optical Networking. She is the recipient of a National Science Foundation Career award. She was awarded the IEEE Leon K. Kirchmayer Prize Paper Award 2002 for her paper, "The Effect Upon Channel Capacity in Wireless Communications of Perfect and Imperfect Knowledge of the Channel," IEEE Transactions on Information Theory, Volume 46 Issue 3, May 2000. She was also awarded the Best Paper Award for G. Weichenberg, V. Chan, M. Medard, "Reliable Architectures for Networks Under Stress", Fourth International Workshop on the Design of Reliable Communication Networks (DRCN 2003), October 2003, Banff, Alberta, Canada. Professor Médards research interests are in the areas of reliable communications, particularly for optical and wireless networks, and in the application of coding to networks.

Eytan Modiano is an Associate Professor in the Aeronautics and Astronautics Department at MIT and a member of The Laboratory for Information and Decision Systems (LIDS). From 1993 to 1999 he was with the Communications Division at MIT Lincoln Laboratory where he designed communication protocols for satellite, wireless, and optical networks and was the project leader for MIT Lincoln Laboratory's Next Generation Internet (NGI) project. He was a Naval Research Laboratory Fellow between 1987 and 1992 and a National Research Council Post Doctoral Fellow during 1992-1993 while he was conducting research on security and performance issues in distributed network protocols. Professor Modiano received his B.S. degree in Electrical Engineering and Computer Science from the University of Connecticut at Storrs in 1986 and his M.S. and PhD degrees, both in Electrical Engineering, from the University of Maryland, College Park, MD, in 1989 and 1992 respectively. Professor Modiano is an Associate Editor for Computer Networks Journal, The International Journal of Satellite Communications, The AIAA Journal of Aerospace Computing, Information, and Communication and Optical Networks Magazine. He had served as a guest editor for a number of special issues including the IEEE JSAC special issue on WDM network architectures; the Computer Networks Journal special issue on Broadband Internet Access and the Journal of Communications and Networks special issue on Wireless Ad-Hoc Networks. He served on the program committee for many major conferences in the networking field including ACM MobiHoc and IEEE Infocom; and was the program co-chair for the 2002 workshop on High-Speed Networks (HSN). His research interests are in the area of communication networks and protocols with emphasis on satellite, wireless, and high speed optical networks.

For registration and further information please visit:

http://web.mit.edu/professional/summer/courses/6.20s.html