

TELCOM Course Descriptions

Revised

7/24/06

Non-Major

TELCOM 2000 INTRODUCTION TO TELECOMMUNICATIONS

Introduction to telecommunications for non-telcom majors. Top-down orientation relates networking technologies to organizational goals and needs. Data communications and Internet technologies and basic system performance analysis. TCP/IP, LANs, WANs, internetworking, and signals and communications media. (Prerequisites: algebra, advisor's approval)

Networking

TELCOM 2100 FUNDAMENTALS OF TELECOMMUNICATIONS

Fundamentals of network technology based on a layered protocol stack. Telephone network and Internet architecture. Summary of upper layer protocols (http, smtp), transport protocols (UDP, TCP), and network protocols (IP). Analysis of link layer protocols and their performance. Overview of local area networks (CSMA/CD and CSMA/CA). Introduction to cables and signals. (Prerequisites: calculus, probability, computer systems)

TELCOM 2110 NETWORK DESIGN

Methods and techniques for the design of computer/telecommunication networks. Management and business perspectives on network design, estimation of traffic demand and application requirements, network cost analysis, topological design, capacity assignment, graph theory and optimization based design algorithms, virtual network design, network design tools, wireless network design issues, availability analysis and survivable network design. (Prerequisites: TELCOM 2000/2100)

TELCOM 2120 NETWORK PERFORMANCE

Introduction to techniques for performance modeling and analysis of computer systems and communication networks. Analysis of measurements, discrete event simulation and queuing theory. (Prerequisites: Calculus, Probability, Programming, TELCOM 2000/2100)

TELCOM 2121 NETWORK MANAGEMENT

Techniques of planning, controlling, organizing and decision making for a telecommunications network; accounting, security, fault management, configuration, and maintenance. Protocols and architectures for network management. (Prerequisites: TELCOM 2000/2100)

TELCOM 2122 TELEPHONE SYSTEM MANAGEMENT

Telephone system administration and the application of telephone systems to assist user organizations in achieving their goals, presented from the user organization's telecommunication manager's perspective. Management of premise equipment, costs, staffing, departmental structure and management, and the services provided by a telephone company's central office. (Prerequisites: TELCOM 2000/2100)

TELCOM 2130 QUEUING THEORY

Development and application of the mathematical techniques used for analyzing the performance of communications net works. Topics include: Markovian queues, Non-Markovian queues, product form networks, approximation techniques, non-stationary queues. (Prerequisites: TELCOM 2120, 2310)

Communication Systems

TELCOM 2200 PHYSICAL LAYER OF COMMUNICATIONS 1

For students who were not electrical engineering undergraduates. Fundamental phenomena, components, and concepts related to electricity and electronics required for TELCOM 2210, as well as for other courses in the curriculum. Telcom applications of AC circuits and bandwidth, semiconductors and

amplifiers, digital electronics and logic design, Fourier theory and frequency analysis. (Prerequisites: Calculus)

TELCOM 2210 PHYSICAL LAYER OF COMMUNICATIONS 2

Electronic communications sequel to TELCOM 2200. Bandwidth, spectrum, noise, and channel capacity, and covers practical issues such as link power budgets and bit-error rates. Broad scope of physical-layer technologies, fundamental concepts, and techniques used in transmitting information over wire-line, optical, and wireless networks. (Prerequisites: Calculus, Probability, TELCOM 2000/2100, TELCOM 2200)

TELCOM 2220 DIGITAL TRANSMISSION

Principles of digital transmission encountered in common carriers and in private networks. Architectures and formats of digital transmission systems, especially the asynchronous and synchronous digital hierarchies. Discusses signal-to noise ratio, link power budgers, analog-to-digital conversion, data compression, digital modulation, and facility switching. (Prerequisites: TELCOM 2210, Programming)

TELCOM 2222 PHOTONIC COMMUNICATIONS

Overview of optics. Fiber-Optic Transport including optical fiber, sources and photo-detectors, optical couplers and switches, photonic signal transport principles for the practical design of fiber-optic links, and an ion-depth discussion of the limits of wavelength multiplexing. Review of switching theory and photonic switching including photonic switching devices and corresponding architectures for switching fabrics, photonic switching in space, time, wavelength, and all combinations, and optical packet and burst switching. (Co-requisite: TELCOM 2200)

TELCOM 2225 SWITCHING SYSTEMS

Public switched telephone network, the telephone and the local loop architecture, inter-exchange networks, and signaling. Evolution of switching technology and architectures and a comparison of various systems. Traffic statistics and the theory of space-division and time-division switching networks. (Co-requisite: TELCOM 2210)

TELCOM 2226 INTELLIGENT NETWORKS

Overview of intelligent network (in) environments, including evolving national private- and public -switched networks as well as computers and databases united with switch process ORS to provide new features and services. Survey of switching software, with the IN as a natural step in the evolution. Emphasis on major changes in intelligent networks and in broadband and wireless networks. (Prerequisites: TELCOM 2000/2100, 2300)

TELCOM 2227 INTERNET TELEPHONY

Technology for offering telephony over an internet including: voice-over-IP end points and protocols, end-to-end delay, telephony signaling protocols, gateways and network components, telephone service provision, multi-point, network issues, and the future. Presents market, policy, and economic issues; differentiates VOIP on public or private internets. (Prerequisites: TELCOM 2000/2100, 2200)

TELCOM 2229 DIGITAL COMMUNICATIONS: MODULATION & CODING

Concepts in digital modulation and coding theory with emphasis on techniques employed in a variety of communication systems, including equalization, detection of signals in noise, spread spectrum communications, modulation and coding, and MIMO. (Prerequisite: TELCOM 2210)

TELCOM 2230 RANDOM SIGNALS AND NOISE

Random variables, their expected values and probability distributions. Conditional probability, estimation, sampling, and decision theory. Functions of random variables, random processes, convolution, and power density spectrum. Applications in statistical design, reliability, coding, signal detection, and noise discrimination. (Prerequisite: TELCOM 2120, 2210)

Computer Communications

TELCOM 2300 SOFTWARE TOOLS AND TECHNIQUES

For students who are not computer science or information science graduates. Builds upon the two programming courses required for admission and presents concepts, algorithms, and methodologies related to data structures, file systems, and operating systems essential to other courses in the MST curriculum. (Prerequisites: Structured Programming Language)

TELCOM 2310 COMPUTER NETWORKS

Foundational principles, architectures, and techniques employed in computer networks. Protocols and mechanisms used in the Internet TCP/IP protocol suite, including the operation of both wide-area and local-area networks. Special emphasis on analysis of network and transport layer protocols. (Prerequisites: TELCOM 2000/2100, 2300; Corequisites: TELCOM 2200)

TELCOM 2320 LOCAL AREA NETWORKS

Analysis of legacy LANS (ethernet, token ring, token bus). Description and analysis of high speed LANS, wireless LANS, sensor networks, and metropolitan area networks. LAN internetworking. (Prerequisites: TELCOM 2310; Corequisites: TELCOM 2120)

TELCOM 2321 WIDE AREA NETWORKS

Basic principles of broadband networks. Protocols suitable for broadband networks, with emphasis on ATM. Other technologies, such as frame relay and SMDS. Design issues for high speed networks including network characterization, application performance guarantees, traffic policing and congestion control. (Prerequisites: TELCOM 2310; Corequisites: TELCOM 2120)

TELCOM 2325 DISTRIBUTED MULTI-MEDIA SYSTEMS

Modeling and design of distributed multimedia systems. A framework is presented for data management, multimedia information management, knowledge management, communication management, activities management, interface management and applications to distributed systems, real-time systems, multimedia systems and information retrieval systems design. (Prerequisites: INFSCI 2710)

TELCOM 2326 DISTRIBUTED DATABASES

Basic concepts in distributed databases and transaction processing technology. Concepts such as concurrency control, replication management, and failure recovery. (Prerequisites: TELCOM 2300; INFSCI 2710, Advanced Standing)

Telecommunications Administration

TELCOM 2400 ACCOUNTING & FINANCE FOR TELCOM

For students who were not business or economics undergraduates. Review of accounting and finance with emphasis on the use of financial information in the decision-making process. Investing, financial accounting, and capital budgeting in the business environment. Recommended for telecommunications students with little accounting or finance background. (Corequisite: TELCOM 2000/2100)

TELCOM 2411 INFORMATION TECHNOLOGY IN ORGANIZATIONS

Assesses consequences of information systems and networks in organizational environments that must accompany installation of these systems and networks. Tools for assessment involving human, social, economic, as well as organizational relationships. System and network life cycle planning leading to development of needs for replacement systems and networks. (Corequisite: TELCOM 2000/2100)

TELCOM 2412 TELECOMMUNICATIONS MARKETING

Strategic marketing principles; creating superior value versus price relationships. Strategic aspects of marketing and how these relate to basic marketing functions such as selling and promotion. The critical importance of achieving and sustaining competitive advantage. Case studies of major telecommunications companies. (Corequisite: TELCOM 2000/2100)

TELCOM 2420 PROJECT MANAGEMENT
Techniques and tools to assist in the managing process. Uses case study approach. (Prerequisite: Advanced Standing)

TELCOM 2430 CASE STUDIES IN TELECOMMUNICATIONS
Investigation of selected applications, the rationale behind, and methodologies for applying network technologies to business applications. Course project. (Prerequisites: TELCOM 2210, 2310, 2120)

Telecommunications Economics and Policy

TELCOM 2510 U.S. TELECOMMUNICATIONS POLICY
A historical review of U.S. telecommunications policy, including both theoretical objectives and practice. The role of the various U.S. governmental agencies in the development of the telecommunications environment. Recent developments. (Prerequisites: TELCOM 2000/2100)

TELCOM 2511 INTERNATIONAL TELCOM POLICY
Issues in international telecommunications; survey of key organizations, e.g., ITU, GATT, INTELSAT, etc.; telecommunications and economic development; international trade in services, competition, and regulation; standards; and trans-border data flow issues. (Prerequisites: TELCOM 2000/2100)

TELCOM 2512 INFORMATION POLICY
Introduction to information policy with a focus on U.S. Federal policies. Issues and challenges faced in developing and implementing policies within organizations and companies, including the protection and use of intellectual property, First Amendment concerns, access to public information, security and the protection of privacy of personally identifiable information, are addressed. (Prerequisites: TELCOM 2000/2100)

TELCOM 2515 INFORMATION ETHICS
Background to ethics as a prelude to learning the skills of ethical decision-making and then, to applying those skills to the real and current challenges of the information professions. Decision-making and challenges related to information sources and services in all formats and media; to the Internet and other digital sources (cyberethics); and to information-related topics in management. (Prerequisites: TELCOM 2000/2100)

TELCOM 2520 TELECOMMUNICATIONS INDUSTRY AND REGULATION
Commercial and legal environment of telecommunications systems in the U.S. and the world. Includes brief historical review of telecommunications in the U.S.; liberalization and privatization; international telecommunications; telecommunications in the European Union; trade in services; developing countries; international organizations. (Prerequisites: TELCOM 2000/2100 or permission of the instructor)

Human Communications

TELCOM 2600 HUMAN COMMUNICATION
Overview of the fields of organizational and interpersonal communication of information both within an organization and between individuals. Relevant research in both fields. Emphasis on principles that affect design of telecommunications systems. (Corequisite: TELCOM 2000/2100)

TELCOM 2610 DESIGNING COMPUTER & NETWORK SERVICES
Underlying concepts in the creation of user-oriented services and applications that run on computer and networked systems; including the definition of service, user access to services, human-computer interaction, sensory operation and transduction, and the operation of various terminals. (Prerequisite: TELCOM 2000/2100)

TELCOM 2611 ORGANIZATIONAL BEHAVIOR
Concepts of organizations from both philosophical and operational perspectives, focusing on the role of technology in institutional functioning. The influence of the cultural-social medium on the process of directing work toward organizational objectives; differential aspects of transporting messages within

hierarchical levels; and the significance of such factors to telecommunications networks. (Corequisite: TELCOM 2000/2100)

TELCOM 2620 SYSTEMS ENGINEERING FOR TELECOMMUNICATIONS

Systems engineering techniques and methodologies as applied to telecommunications system and networks. Determination and analysis of user need, specification preparation, conformance of design to specification, and marketing. (Prerequisite: TELCOM 2000/2100)

Wireless Communications and Networks

TELCOM 2700 INTRODUCTION TO WIRELESS NETWORKS

For students with a basic background of telecommunications who are not for Telecom Majors. Principles of wireless communications and how they differ from wired communications. Fundamental concepts including: transmission and mitigation techniques (e.g., modulation and coding, propagation, interference and antennas) for wireless systems, multiplexing techniques, wireless system architectures, mobility management, security, protocols and location technology. Systems include: cellular phone networks (e.g., cdma2000, UMTS), wireless local area networks (e.g., IEEE 802.11g), personal area networks (e.g., Bluetooth), fixed point broadband wireless (e.g., WiMAX) and satellite systems. (Prerequisite: TELCOM 2000/2100)

TELCOM 2710 FOUNDATIONS OF WIRELESS COMMUNICATIONS

Radio propagation and multipath fading, antennas, digital modulation with emphasis on techniques being used in current wireless systems including $\pi/4$ DQPSK, GMSK, error control coding in wireless systems, spread spectrum and CDMA, OFDM, MIMO, and spectrum issues. Mathematical and qualitative treatment of existing systems as examples rather than as abstractions. (Prerequisite: TELCOM 2210)

TELCOM 2720 CELLULAR AND WIRELESS NETWORKS

Cellular and mobile communication networks and their components including first generation analog cellular phone systems; traffic engineering; mobility management; intersystem operation; second generation digital cellular standards: GSM, IS-95 (cellular CDMA); short message service (SMS); 2.5 G data services (e.g., GPRS) and third generation cellular standards cdma 2000 and WCDMA/UMTS. Location technology and advanced services, personal area networks and wireless local area network technology. (Prerequisite: TELCOM 2210)

TELCOM 2721 MOBILE DATA, AD HOC AND SENSOR NETWORKS

Review of mobile data networks. Personal area and mobile ad hoc networks. Self organization, topology control, and routing in ad hoc networks. Sensor/actuator applications, systems and networks. Protocols to support sensor and mobile ad hoc networks. (Prerequisite: TELCOM 2210)

TELCOM 2725 CODE DIVISION MULTIPLE ACCESS

Theory and application of code division multiple access (CDMA) techniques for digital wireless communications. Emphasis on CDMA in mobile cellular communications. (Prerequisite: TELCOM 2710)

TELCOM 2727 APPLICATION DEVELOPMENT FOR MOBILE DEVICES

Focus on information system applications that run on top of wireless infrastructure such as multimedia messaging, mobile inventory control, location aware services including wireless technologies (GSM, CDMA2000, UMTS, 802.11, Bluetooth), mobile information systems and applications (M-Business, location-based services, wireless CRN), wireless information system challenges and architectures (security, reliability, mobility, power conservation, gateways, proxies), mobile application protocols (SMS, EMS, MMS, WAP), thin and thick client mobile application development (WML, VXML, Java, J2ME, J2EE, .NETCF, C#), and business case studies of mobile applications. (Prerequisite: TELCOM 2700, Java or other structured programming language)

TELCOM 2730 CAPSTONE IN WIRELESS NETWORKS

Selected applications; rationale behind and methodologies for applying wireless network technologies to business applications. Course project. (Prerequisites: TELCOM 2210, 2310, 2120, 2720/2721)

Telecommunications Security

TELCOM 2810 INTRODUCTION TO SECURITY

Fundamental issues and first principles of security and information assurance (confidentiality/privacy, integrity, authentication, identification, authorization, availability, access control). Business issues of risk analysis and management of resources. Issues in information systems security; analysis, design, and coding of information systems/ networks for security; techniques for building secure organizational systems; e-commerce related security issues; policy, legal and ethical issues in security. (Prerequisites: Operating systems, data structures, databases, mathematical logic)

TELCOM 2813 SECURITY MANAGEMENT

Security management in information systems and networks. Intrusion detection systems, anomaly detection, network forensics, application logging, auditing and data management, contingency planning, digital immune systems; alarm and responses; security standards; ethical and legal issues in information; cyber-evidence. (Prerequisites: TELCOM 2810/2821, Programming Language)

TELCOM 2820 CRYPTOGRAPHY

Principles of number theory, cryptographic algorithms and cryptanalysis. Steganography, block and stream ciphers, secret key encryption (DES, RES, RE-N), primes, random numbers, factoring, and discrete logarithms. Public key encryption (RSA, Diffie-Helman, elliptical curve cryptography, N'TRU); key management, hash functions (MD5, SHA-1, RIPEMD-160, HMAC). (Prerequisites: Algebra, College Mathematics, Digital logic, Programming Language, TELCOM 2000/2100)

TELCOM 2821 NETWORK SECURITY

Principles of network security and management. Review of network vulnerabilities, security at the link, network and transport layers; dial-up security (PAP, CHAP, Radius, Diameter), IPSEC, SSL, and VPNS. Email security (PGP, S/MIME); Kerberos; X.509 certificates; AAA and mobile IP; SNMP security; firewalls; filters and gateways; policies and implementation of firewall policies; stateful firewalls; firewall appliances. (Prerequisites: TELCOM 2810/2820, TELCOM 2000/2100)

TELCOM 2825 INFORMATION SYSTEMS & NETWORK INFRASTRUCTURE PROTECTION

Techniques for the protection and survivability of information systems and networks. Critical infrastructure definition, risk management, vulnerability and risk analysis, fault and attack trees, availability analysis, traffic restoration schemes and survivable network design and management techniques; critical infrastructure simulation, CIP policy and legal issues, SCADA systems.. (Prerequisites: TELCOM 2000/2100/2810)

TELCOM 2829 ADVANCED CRYPTOGRAPHY

Algorithm complexity, advanced number theory (Galois fields, quadratic residues, zero knowledge schemes, one-time signatures), efficient implementation of encryption schemes in hardware and software and other advanced topics in cryptography. (Prerequisites: TELCOM 2820)

TELCOM 2830 CAPSTONE IN SECURITY

Integrative class for masters students in their final semester of the SAIS track. Combination of business and technical case studies and group projects. Case studies focus on business/economics aspects of providing information assurance and how this service impacts technology. Group projects involve design and development of a prototype secure and survivable information system including application development, system deployment, system optimization and system economics. (Prerequisites: TELCOM 2810/INFSCI 2150, TELCOM 2821)

Independent Studies

TELCOM 2921 INDEP STUDY IN NETWORKING 1 units min / max

TELCOM 2922 INDEP STUDY IN COMMUNICATION SYSTEMS 1 units min / max

TELCOM 2923 INDEP STUDY: COMPUTER COMMUNICATIONS 1 units min / max

TELCOM 2924 INDEP STUDY: TELCOM ADMINISTRATION 1 units min / max
TELCOM 2925 INDEP STUDY: TELCOM ECONOMICS & POLICY 1 units min / max
TELCOM 2926 INDEP STUDY: HUMAN COMMUNICATIONS 1 units min / max
TELCOM 2927 INDEP STUDY IN WIRELESS NETWORKS 1 units min / max
TELCOM 2928 INDEP STUDY SECURITY ASSURED INFORMATION SYSTEMS 1 units min / max

Special Topics

TELCOM 2931 SPECIAL TOPICS IN NETWORKING 1 units min / max
Selected relevant subjects in networking, either as a traditional course or as a survey of new literature. Content varies depending on student and instructor interest.

TELCOM 2932 SPECIAL TOPICS IN COMMUNICATION SYSTEMS 1 units min / max
Selected relevant subjects in telecommunications, either as a traditional course or as a survey of new literature. Content varies depending on student and instructor interest.

TELCOM 2933 SPECIAL TOPICS IN COMPUTER COMMUNICATIONS 1 units min / max
Selected relevant subjects in telecommunications, either as a traditional course or as a survey of new literature. Content varies depending on student and instructor interest.

TELCOM 2934 SPECIAL TOPICS IN TELCOM ADMINISTRATION 1 units min / max
Selected relevant subjects in telecommunications, either as a traditional course or as a survey of new literature. Content varies depending on student and instructor interest.

TELCOM 2935 SPECIAL TOPICS IN TELCOM ECONOMICS & POLICY 1 units min / max
Selected relevant subjects in telecommunications policy or economics, either as a traditional course or as a survey of new literature. Content varies depending on student and instructor interest

TELCOM 2936 SPECIAL TOPICS IN HUMAN COMMUNICATIONS 1 units min / max
Selected relevant subjects in human communications, either as traditional course or as survey of new literature. Content varies depending on student and instructor interest.

TELCOM 2937 SPECIAL TOPICS IN WIRELESS NETWORKS 1 units min / max
Selected relevant subjects in wireless telecommunications, either as traditional course or as survey of new literature. Content varies depending on student and instructor interest.

TELCOM 2938 SPECIAL TOPICS IN TELCOM SECURITY 1 units min / max
Selected relevant subjects in Telecommunications security, either as traditional course or as survey of new literature. Content varies depending on student and instructor interest.

Practicum and Thesis

TELCOM 2940 PRACTICUM 1 units min / max
For students who desire experience in applying the knowledge and skills acquired in their course work and laboratory sessions. Students are responsible for arranging a practicum with a business or organization.

TELCOM 2941 MASTER'S THESIS min / 6 units max
The thesis is a report of original, theoretical, or laboratory work suitable for publication.