

Southern Methodist University
Department of Electrical Engineering
Telecommunications (EETS) Course Descriptions

7301 Introduction to Telecommunications

Overview of public and private telecommunications systems, traffic engineering, switching, transmission and signaling. Channel capacity, media characteristics, Fourier analysis and harmonics, modulation, electromagnetic wave propagation and antennas, modems and interfaces, and digital transmission systems. DSL technologies, digital microwave, satellites, fiber optics and SONET, and Integrated Services Digital Networks.

7304 Network Protocols

An introductory course on the protocol architecture of the Internet, following a bottom-up approach to the protocol layers. Provides an understanding of the internetworking concepts in preparation for advance networking courses. Includes 1) networking technologies such as local area networks, packet switching and ATM, 2) the Internet protocol and TCP/UDP in depth and 3) an overview of important application protocols such as HTTP, client/server computing, SMTP, FTP and SNMP. *Prerequisite:* EETS 7301 .

7305 Telecommunications Regulation

This course reviews the evolution of telecommunications in the United States as well as investigates current regulatory topics including the Internet and international regulation. It relates regulatory decisions to real world issues such as telecommunications services acquisition and pricing. Topics that include both domestic and international components including regulation of the electromagnetic spectrum and standards organizations are also investigated. *Prerequisite:* EETS 7301 .

7316 Wireless, Cellular and Personal Telecommunications

Comprehensive course in the fast developing field of wireless mobile/cellular and personal telecommunications. Mobile/cellular communications: frequency allocations, base station site selection, cellular structures, channel trunking, analog cellular signaling, handover, data over cellular, multipath fading, diversity reception, modulation techniques, speech coding, digital cellular design including GSM and TDMA, spectral efficiency considerations, spectral management and regulations, roaming, and current world systems and standards. Personal communications: basic concepts and terminology for PCS; PCS technology; design based on GSM, TDMA and CDMA; spectrum sharing with other services such as GSM; PCS standards; intelligent networks for PCS; global challenges for PCS; third-generation wireless; number portability and roaming; and satellites in wireless. Primarily for the telecommunications program but can also be very useful for EE students who plan to specialize in this field. *Prerequisites:* EETS 7301 .

7341 Fiber Optics in Telecommunications

An introductory course designed to familiarize students with practical concepts involved in optical fiber communications systems. Develops basic optical principles. Includes dielectric-slab waveguides, fiber waveguides and integrated optics devices. Covers the major components of a fiber communications link, including optical sources, detectors and fibers. Also the current state of the art and expected future directions in optical telecommunications, such as coarse and dense wavelength division multiplexing and dispersion compensation (electronic and optical methods).

8303 Switching and Routing

Switching and routing architectures, protocols and functions are explained. For switching, Spanning Tree Protocol (STP) and Virtual LANs (VLANs) are covered. Dynamic routing protocols including RIP (version 1 and 2), OSPF, IS-IS and BGP Cisco's EIGRP are examined. IP sub-networks with and without classes are analyzed. Simulation tools are used to analyze the operation and performance of different protocols. *Prerequisites:* EETS 7304.

8304 Multiprotocol Label Switching

This course examines the Multiprotocol Label Switching (MPLS) protocol and its applications in networks and has three parts. Part I part introduces the basics of MPLS as well as MPLS Traffic Engineering (TE), DiffServ Quality of Service and network survivability. Part II investigates Layer 2 and Layer 3 MPLS Virtual Private Networks (VPNs). Part III covers MPLS management, access networks, MPLS-Transport Profile (MPLS-TP) and GMPLS. *Prerequisites:* EETS 7304.

8305 Telecommunications Software Design

Comprehensive course to familiarize telecommunications professionals with the state-of-the-art software concepts and technology in modern telecommunications applications. Focuses on software process modeling, user interface design, CASE tool, reusability, quality assurance, reliability, distributed computing, real-time operating system and database and understanding of Real-Time Object-Oriented Modeling in analysis and design, and high-level programming language design concepts such as C++ as required in telecommunications software development. Emphasis on real world applications, including Central Office or Private Branch Exchange switch, Computer Telephone Integration, LAN-to-WAN Node Processor, Advanced Intelligent Network, Cellular/Personal Communications Service, Asynchronous Transfer Mode, Integrated Services Digital Network. *Prerequisites:* EETS 7301 plus knowledge of a high-level programming language.

8311 Intelligent Networks

A comprehensive course in providing broad knowledge in IN by exploring the theoretical network/call models of the ITU-T and ANSI and practical experiences of implementing IN technologies and services. Explains in detail important IN elements such as the Service Creation Environment, Service Management Systems, Service Control Point, Signal Transfer Point, Service Switching Point and Intelligent Peripheral. Includes implementation scenarios for IN elements starting with the ITU-T Service Independent Building Blocks to actual service deployment. Covers harmonization of IN with Telecommunications Management Network, the future of IN with

migration to Telecommunication Information Networking Architecture and hurdles to IN, e.g., feature interaction, Local Number Portability example and IN/IP/CTI integration. Live demonstrations of IN service creation and execution will be presented. *Prerequisite:* EETS7304.

8313 Internet Telephony

A comprehensive introduction to the background, protocols, standards and issues related to Internet telephony. Describes the changing telecommunications environment that motivates the transition from today's telephone network to voice over IP and strategies being used by companies and individuals to implement VoIP. Covers as an umbrella protocol the Session Initiation Protocol (SIP) with its partner Session Description Protocol (SDP). Also, other protocols including H.323, RSVP, RTP, DNS, TRIP, ISUP and SS7. Issues including emergency services, security, mobility and quality of service. On-campus students and off-campus students with high-speed Internet access will have access to SIP lab equipment. *Prerequisites:* EETS 7304.

8315 Advanced Topics in Wireless

Focuses on next generation systems, wireless data and emerging wireless systems and technologies. Covers the IMT2000 requirements, proposals and evolution path for CDMA and TDMA technologies toward LTE /4G systems and beyond.. Detailed study of Radio Access network for the General Pack Radio Services, Enhanced Data for Global TDMA Evolution, WCDMA and CDMA2000 as well as core network evolution. Also covers second generation wireless data systems such as Cellular Digital Packet Data and Short Message Services. Mobile IP and Wireless Application Protocol. Other topics that may be covered include LMDS, WILL , indoor systems, cordless phones and WLAN. *Prerequisite:* EETS 7316.

8316 Wireless Networks

Comprehensive introduction to various transport layer protocols especially focusing on wireless networks. Begins with a study of various traffic scenarios in different elements of a wireless network. Then, looks at various applications using 3G, 4G and beyond. Finally, discusses methods for performance monitoring and network testing. *Prerequisite:* EETS 7316.

8317 Switching and QoS Management in IP Nets

A comprehensive course on Internet protocol switching and quality of service management technology, protocols and applications. Part I concentrates on the fundamentals of IP and ATM switching architecture, including the Internet Engineering Task Force efforts on IP switching technology and the commercial deployment of multiprotocol label switching equipment and its evolution toward IETF MPLS architecture. In contrast to the current data-oriented best-effort IP network, the next-generation IP network will have to carry time-critical and QoS sensitive real-time traffic, such as voice and video. Thus, the mechanisms for guaranteeing QoS for service requirements are critical in an MPLS network. Part II addresses the mechanisms for end-to-end QoS management in an MPLS network, including MPLS traffic engineering, MPLS support for integrated and differentiated services, QoS routing algorithms and MPLS signaling support for RSVP-TE and CR-LDP. Bandwidth Broker and Service Level Agreement server. Policy-based architecture for QoS management methods will also be discussed. Part III focuses on the applications and network-evolution issues of MPLS technology, including

MPLS-based VPN architectures and MPLS over DWDM networks and GMPLS.

8321 Telecommunications Network Security

A graduate-level survey of the technologies underlying network security. First, covers the principles of private and public key cryptography. Describes a number of examples of encryption algorithms, including DES and AES. Includes the use of encryption with hash functions for digital signatures and certificates. Second, covers perimeter security including firewalls, intrusion detection systems, viruses and worms. Finally, covers a number of secure protocols including secure e-mail, secure HTTP, IPSec and virtual private networks. Does not cover topics that are part of general security but peripheral to network security, e.g., physical tamper resistance, security policies, digital rights management and biometrics. *Prerequisite:* EETS 7304.

8322 Data Compression for Multimedia Application

An introduction to techniques for efficient compression and coding of audio and video signals for multimedia applications. Includes speech and vision models, sampling and quantization of one- and two-dimensional signals, coding techniques for audio and video signals, and existing and evolving standards for audio and video coding. *Prerequisite:* EETS 7304 or permission of the instructor.

8331 Network Analysis, Architecture and Design

This course focuses on the systematic process of network design. The course explains the process of gathering network requirements. Data flow analysis and the selection of network architectures are covered. Addressing and routing; network management; network performance criteria; and security and privacy architecture selection methods are also discussed. These techniques are merged to create a complete network design framework. *Prerequisite:* EETS 7304.

8332 Advanced Network Design

This capstone course provides a holistic view of network design practices. It begins with a review of network design fundamentals such as conventional and Voice over IP (VoIP) voice networks, data networks and queuing theory, Multiprotocol Protocol Label Switching (MPLS) and optical network design methods. These methods are integrated to accomplish and analyze networks from multilayer network design perspective. A significant portion of the course focuses on completing a complex network design using state-of-the-art software tools. *Prerequisite:* EETS 8331.

8337 Telecommunications Network Management

Comprehensive course in the important issues in telecommunications network management. Overview of the underlying principles – operation, administration, maintenance and provisioning – which are often the most expensive and labor-intensive aspects of telecommunications. Includes different paradigms for network management such as the Internet Simple Network Management Protocol (SNMP, SNMPv2) and the Open System Interconnection Common Management

information protocol. Covers the object-oriented modeling approach such as the ITU-T Telecommunications Management Network and Bellcore's Information Networking Architecture.. Network simulation, configuration, fault, security, accounting, performance management and the Quality of Service (QoS) concepts. Drivers for network management and its traditional practice, as well as future needs.

8341 Optical and DWDM Networks

Provides a basic understanding of the underlying optical networking technologies from concept and design to deployment. Optical networks, especially the dense wavelength division multiplexing, are not just for long-haul systems anymore. Using DWDM adds an important new dimension to existing fiber networks in metropolitan and local access network environments. This course begins with a look at the bandwidth drivers that will determine the coming requirements for this novel technology and considers the business case for its deployment. Reviews fiber-optic technology with an emphasis on the characteristics of particular fiber types used to support DWDM technology, as well as the workings of a DWDM system. Also discusses key DWDM technologies, such as optical filters, optical amplifiers, optical add/drop multiplexing systems, optical cross connect switches and other optical communication devices, keeping in mind the impairments that can limit DWDM transmission distances and speeds. Finally, presents current DWDM network configurations and architectures with a focus on the real-world applications of this promising new technology. Emphasizes DWDM system design issues, DWDM ring and mesh network topologies, fault avoidance, provisioning, performance monitoring and current research.