Network and Telecommunications Courses
Detailed syllabi available at http://www.cdm.depaul.edu/

IT 263 - Applied Networks and Security
This course introduces the networking and security technologies required to build and maintain a home or small-office network. Networking topics will include client/server application software configuration, network connectivity (cabling, switch and router configuration), basic IP addressing, network address translation and options for public Internet access services. Security topics will include typical threats and responses, firewalls, host hardening, password management and virtual private network (VPNs). The course has a lab component where students apply wired and wireless technologies to design and administer a small network with various applications. PREREQUISITE(S): none

TDC 261 - Basic Communications Systems
(Formerly TDC 361) Introduction to voice, data, and multi-media network communications fundamentals. Wired, Wireless, and Optical applications in Local, Metropolitan, Wide Area Networks are explored. The overview explains how technical, regulatory, competitive, standardization and cultural factors impact modern network applications. Approved for Scientific Inquiry credit. PREREQUISITE(S): NONE

TDC 311 - Computers in Telecommunications Systems
An introduction to computer organizations and operating systems. Computer components and functions, logic circuits, internal processing, multiprogramming, timesharing, memory management, file management, interrupts and I/O peripheral devices. PREREQUISITE(S): CSC211 or CSC261.

TDC 362 - Principles of Data Communications
Theory and components of data communication systems, modes, codes, and error detection techniques for data transmission, network protocols and line control procedures, communication carrier facilities and system planning. PREREQUISITE(S): (TDC 311 or CSC373) and (IT 263 or TDC361)

TDC 363 - Introduction to Local Area Networks
Principles of computer networks using LANs as an example. Issues in communications protocols and compatibility. Switched network technologies. LAN design and management. Students will complete various labs using both Windows and Linux servers. PREREQUISITE(S): IT 263 OR TDC 261.

TDC 364 - Voice Communications Technologies
A detailed study of transmission, signaling and switching systems for facilities-based public and private voice networks. Voice digitization and transmission over circuit-switched and packet-switched infrastructures. Voice over IP using H.323 and SIP. Quality of service issues in integrated voice-over-data systems. Course may include laboratory work with SIP services. PREREQUISITE(S): NONE.

**TDC 365 - Network Interconnection Technologies**
A comprehensive study of network interconnection technologies including layer 3 routers and higher-layer gateways. The TCP and IP protocols will be studied in detail, including IP address management and router operations and management along with associated Internet protocols. RIP and OSPF protocols will be considered. Course includes laboratory work with protocol analyzers and router administration.
PREREQUISITE(S): IT 263 or TDC 361.

**TDC 368 - Network Programming**
Programming distributed client/server applications; the sockets interface and multitasking issues; client/server models; remote procedure call; examples of applications such as electronic mail and file transfer. PREREQUISITE(S): CSC261 or CSC309.

**TDC 369 - Network Performance Analysis and Design**
Quantitative foundations of network performance analysis. Probability theory and queueing theory will be developed and applied to problems in LAN performance, traffic engineering, and the analysis of throughput and response time measures for data communications networks. Performance tradeoffs in network design.
PREREQUISITE(S): IT223 and MAT151 and TDC365.

**TDC 371 - Wireless Communications Networks**

**TDC 372 - Digital Access Services**
A survey of access line technologies used to access Internet and other business network services. Topics will include traditional DS1, DS3 and SONET transport as well as Digital Subscriber Line (DSL), Cable Modems, satellite services, ATM, MPLS, and wireless data access methods. PREREQUISITE(S): IT263 or TDC361.

**TDC 375 - Network Protocols**

**TDC 376 - Network Project**
Case study in developing a large network project. Students will work in groups to analyze and design a major network system. PREREQUISITE(S): TDC 365.
TDC 377 - Fundamentals of Network Security

Fundamentals of Network security design and implementation. Review of components used in an enterprise security infrastructure including routers, firewalls, security auditing and assessment tools, Virtual Private Networks (VPN) and Intrusion Detection Systems (IDS). The integration of the different components will be studied in detail, including IP addressing, Network Address Translation (NAT), design of firewall rule sets and performance considerations. Course includes laboratory work with routers, firewalls, Virtual Private Networks and security assessment tools. Pre-req: TDC 365.

TDC 379 - Telecommunication and Network Security Practicum

Design and implementation of telecommunication and network security infrastructure. This laboratory-based class includes the setup of realistic network infrastructure environment using bridges, routers, layer 2/3 switches and servers. Advanced routing infrastructure implementation using OSPF, RIPv2, EIGRP, BGP, multi-homed BGP setups and IGP/EGP redistribution. Network infrastructure hardening using routers and switches. PREREQUISITE(S): TDC 365 or Instructor consent. Good knowledge of TCP/IP is required.

TDC 390 - Topics in Network Technology

May be repeated for credit. (PREREQUISITE(S): Completion of TDC 363 and TDC 365 or consent of the instructor).

TDC 399 - Independent Study

Independent study for variable credit. PREREQUISITE(S): Requires approval of faculty advisor and consent of the Dean.

TDC 425 - Voice/Data Network Fundamentals

This course provides an introduction to voice and data networking technologies, including public and private voice services, Ethernet and Internet data technologies, network security, business applications and network management. The structure, regulation and history of the telecom and data network industry will be discussed as well. PREREQUISITE(S): Graduate Standing. Students majoring in MS Telecom or MS CINS programs will not receive credit for this course.

TDC 431 - Emerging Wireless and Mobility Networks

A study of evolving 2.5, 3rd & 4th Generation Wireless Networks, and disruptive technologies like WiFi(802.11), WiMax, Bluetooth, RFID, Ultra-Wideband and the security implications mobility networks. This course provides a balanced view of the Wireless Industry in transition, through evolving technology, regulation, competition and standards. Students will be better prepared to deal with the rapid changes and seize the opportunities as data mobility impacts traditional telecommunications and private networks. In addition students will have access to extensive Global Wireless Education Consortium materials to support their individual advanced interests. PREREQUISITE(S): IT263 or TDC361

TDC 432 - Computer and Information Systems Modeling
Simulation, analytic modeling, and measurement of computer and information systems. Operational analysis. Introduction to queuing theory. PREREQUISITE(S): IT223 AND MAT 151 AND TDC 463.

TDC 460 - Foundations of Network Technologies
An introductory course on network technologies for local and wide area networks. The course examines in detail the core concepts of network architectures, Ethernet systems including wired, wireless, and Metro, virtual local area networks, storage area networks, optical networking, and the more traditional network services such as T-1, frame relay, Asynchronous Transfer Mode (ATM), and SONET. PREREQUISITE(S): TDC 261

TDC 463 - Computer Networks and Data Systems
A detailed discussion of the upper layers of network architectures. Network protocol organization will be discussed using TCP/IP as an example. IP addresses, subnetting, supernetting, and CIDR. Routing algorithms. Transport layer protocols. Application layer protocols. Introduction to IPv6. PREREQUISITE(S): IT263 or TDC361 or TDC425 or ECT425.

TDC 464 - Converged Multimedia Networks
Exploration of multimedia networks including voice, data, and video services offered by network carriers and Internet Service Providers (ISP) to both enterprise and residential customers. The course starts with an overview of current voice and data networks and presents the driving forces leading to a converged multimedia network. The focus is on Voice over IP (VoIP), including signaling, protocols, equipment, network architecture/design, traffic engineering, and service deployment strategy. PREREQUISITE(S): TDC 460 and TDC 463

TDC 476 - Economics of Telecommunication Systems

TDC 477 - Network Security
Network infrastructure security issues, including perimeter security defense, firewalls, Virtual Private Networks, Intrusion Detection Systems, wireless security, network security auditing tools and ethical considerations. Strategies for the deployment of "Defense-In-Depth" mechanisms in an enterprise computing environment. Pre-requisite(s): TDC 463 Computer Networks or consent from instructor (CNS 340 Foundations of Information Assurance recommended).

TDC 489 - Queuing Theory with Computer Application

TDC 511 - Telecommunications Practicum
Introduction to the functionality and management of voice and data communications equipment in the Telecommunications and Local Area Networks laboratories. Emphasis will be on practical understanding and experience through laboratory exercises. PREREQUISITE(S): TDC 463.

TDC 512 - Cellular and Wireless Telecommunications
An overview of cellular telephony including regulatory framework, RF design and frequency reuse, signaling and wireline interconnection issues. Personal Communications Systems (PCS), mobile radio, satellite and paging systems will also be considered. PREREQUISITE(S): TDC 464.

TDC 514 - Computer Telephony
A study of enabling technologies allowing the integration of voice communications services with personal computers, LANs and mainframes. Telephony programming interfaces, call management software, intelligent fax/data retrieval and interactive voice response systems will be considered. PREREQUISITE(S): TDC 463 and TDC 464.

TDC 532 - Wireless System Engineering and Deployment
An exploration of topics that were introduced in the prerequisite TDC 512 ('Cellular and Wireless Communications'). This course presents an in-depth focus on radio frequency (RF) theory; RF propagation issues; antenna propagation theory; propagation modeling; and base station power plant and battery systems. GSM and CDMA digital wireless standards / technologies will be covered in detail. A course project is required, where student teams will develop a detailed business plan for overlaying GSM technology onto a legacy, IS-136 (TDMA) wireless network. PREREQUISITE(S): TDC 512

TDC 560 - Advanced Network Technologies and Design
This course introduces advanced network technologies and design, including Multi-Protocol Label Switching (MPLS), MPLS Virtual Private Networks, IP storage networks, content distribution, capacity planning and traffic engineering. PREREQUISITE(S): TDC 460, TDC 463

TDC 561 - Network Programming
The course covers the basic and advanced issues of TCP/IP networking programming such as multiple processes, I/O multiplexing, multi-threaded processes, multicasting and secure network programming USING C/C++. Application examples such as Internet browsing, instant messaging, proxy filtering and file transfer protocols are discussed. PREREQUISITE(S): (CSC309 or CSC262) and (TDC463 or SE435).

TDC 562 - Computer-Communication Network Design and Analysis
This course provides an in-depth study of Internet protocols from the perspective of network planning, simulation and troubleshooting. The course includes in-depth study of Internet traffic, traffic measurement techniques, network planning and simulation using simulation tools, and packet management techniques. PREREQUISITE(S): TDC 463.

TDC 563 - Protocols and Techniques for Data Networks
Advanced topics in TCP/IP including IPv6, TCP traffic control, routing protocols, multicast routing protocols, and upper layer protocols supporting Quality of Service (QoS) in the new generation of the Internet. PREREQUISITE(S): TDC 463.

**TDC 564 - Local Area Networks**

A detailed discussion on wired and wireless LAN technologies and their applications to the enterprise networks. Topics include LAN standards, protocols, network equipment, and network design. The course starts with the standard Ethernet, from 10M to 10G LANs, and then presents advanced Ethernet technologies on fault tolerance, flow control, Quality of Service (QoS), and Metro Ethernet. The course also covers WLAN security and Storage Area Networks (SAN). PREREQUISITE(S): TDC 463.

**TDC 565 - Voice and Data Integration**

Exploration of integrated voice and data networks with the focus on Voice over IP (VoIP) networks and services. The course starts with an overview of current voice and data networks and presents the driving forces leading to a converged network. Student will learn the overall VoIP architecture for enterprise and carrier networks, new services (such as unified message service), and network components (such as IP phone, call manager, and media gateway). The course seeks a balance of theory and practice where students will learn interworking protocols, such as H.323, SIP, and SS7 over IP, and use a packet sniffer to capture and analyze VoIP traffic. Other topics covered are vocoding, QoS, traffic engineering, and measurement of voice quality. Prerequisite: TDC 463 and TDC 464

**TDC 566 - Broadband Access Technologies**

This course studies internetworking technologies between the private intranet and public internet, and it is also known as Wide Area Network (WAN) technologies. The course starts with the narrowband technologies such as ISDN and X.25 to help students learn WAN from a historical perspective. After that, student will learn the current broadband technologies, including leased lines (T1 to OC-x), Frame Relay, ATM, and DSL. The next topic is the emerging broadband technologies such as Wireless (WiFi and WiMax) and Multi-Protocol Label Switch (MPLS). Remote access is an integral component of WAN and it covers dial-up and virtual private network (VPN). The course also covers the issues of WAN design, engineering, and management. (Prerequisite: TDC463)

**TDC 567 - Telecommunication Systems Design and Management**

The theory and practice of Telecommunication system design. Ongoing systems management. Telecommunication management including selection of vendors/systems, structuring an RFP systems proposal analysis, computer aided telecommunications management. Telecommunication management strategies from a business perspective. PREREQUISITE(S):TDC 463.

**TDC 568 - Network Management**
The five major areas of network management—fault management, performance management, security, accounting and configuration management—are discussed. Advanced topics such as fault diagnosis and isolation, event correlation, MIB design, SNMP programming, performance monitoring, service level agreements and network security architectures are also discussed. PREREQUISITE(S): TDC 463.

**TDC 569 - Telecommunication Regulation, Policy, law and Standards**

**TDC 573 - Multimedia Networking**
This course addresses the concepts, architecture and design of Quality of Service (QoS) networks and distributed multimedia systems. Key issues in designing networked multimedia systems are discussed, including reliable multi-point communication/IP multicasting, media coding and compression, audio/video streaming, audio/video transmission, media synchronization, multimedia traffic demands and requirements, congestion control and scheduling. PREREQUISITE(S): TDC 561 or TDC562.

**TDC 577 - Network Security II**
This course is an advanced class in network security. Topics include: Intrusion Detection and Prevention Systems; Security Engineering processes; Advanced firewall considerations; Honeypots; Incident response; Forensics; Enterprise security policy development and complex enterprise security infrastructure design and integration. PREREQUISITE(S) TDC 477 or TDC 572

**TDC 588 - Advanced Network Defense Systems**
This course focuses on developing techniques for attack detection and mitigation in enterprise networks. The course includes: traffic/log analysis, anomaly detection, intrusion prevention, adaptive security policy, alarm analysis, and worm contaminating and quarantining, performance evaluation of defense systems. Special emphasis will be giving to developing intelligent network defense systems. Thus, students must be prepared to do programming projects using any platform or programming language. PREREQUISITE(S) TDC 477 and (CSC309 or CSC212 or CSC261)

**TDC 593 - Topics in Telecommunications**
This is an independent study course. PREREQUISITE(S): Consent of instructor. Independent study form required.

**TDC 594 - Network Capstone**
In this class students will synthesize knowledge from previous courses to design, build, test, and demonstrate a comprehensive network project as members of a project team. Topics introduced or reviewed, and used in completing the project, will include network requirement analysis, network architecture design, vendor evaluation, planning, experimental design, physical design, logical design, security design, testing strategy, documentation, change management, and network management strategy. Other topics include reasoning about uncertain user requirements, negotiation, online meeting techniques, and group dynamics. The capstone course will extensively use the DLPOD environment and the OPNET for network design and experiment.