NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
ITN 100 - INTRODUCTION TO TELECOMMUNICATIONS (3 CR.)

Course Description

Surveys data transmission systems, communication lines, data sets, network, interfacing, protocols, and modes of transmission. Emphasizes network structure and operation. Lecture 3 hours per week.

General Course Purpose

This course provides a comprehensive foundation in the principles and practices of telecommunications. It provides an overview of communications technologies, standards and protocols. Students will learn the basics of internet and its operation. It also provides students an understanding of communication administration, digital audio and video. This knowledge is expected from any network or IT professional.

Course Prerequisites/Corequisites

Prerequisite or corequisite: ITE 152.
Prerequisite also met by completion of ITE 115 or ITE 119.

Course Objectives

Upon completion of this course, the student will be able to:

A. Identify modern communications and network trends.
B. Explain the various data transmission media to include both analog and digital transmission and data coding techniques.
C. Explain networking protocols at all layers of the OSI model and their operation.
D. Explain major line sharing techniques (i.e. circuit sharing and packet sharing).
E. Identify the issues regarding local area networks to include topology and network protocols.
F. Explain data communication techniques used to facilitate decentralization of data processing.
G. Identify the important elements of data communications equipment and describe their function.
H. Explain the OSI 7-layer model for standards development.
I. Explain Internet technology.
J. Understand digital image and audio processing techniques.

Major Topics to be Included

1. Communication system and OSI model
2. The business environment
3. Data communication codes and transmission media
4. Communication interface and modem
5. Communication networks
6. Line sharing
7. Protocols
8. Digital and analog signal transmission
9. Communication Administration
10. Internet Basics
11. Internet operation and addressing
12. Digitizing grayscale and color images
13. Digital video
14. Digital audio

Student Learning Outcomes

1.0 Communication system and OSI model
        1.1 Explain the OSI reference model and layers.
        1.2 Discuss the TCP/IP layers and similarities to OSI.
        1.3 Explain the OSI layer functions and purpose.
        1.4 Explain message transmission and message type.
        1.5 Describe communication basic components.
        1.6 Explain signal and systems, and signal propagation.
        1.7 Describe the different vehicles of transmission.
        1.8 Explain transmission basics in relation to reference model.
        1.9 Define and explain distributed processing and distributed network.
        1.10 Explain distributed forms of computing (vertical and horizontal).
        1.11 Discuss centralized processing and its applications.
        1.12 Introduce the evolution of modern communications systems
        1.13 Discuss several business data communication issues and efficiency.
        1.14 Distinguish between analog and digital data and signals.

2.0 The business environment
        2.1 Describe the importance and characteristics of information.
        2.2 Explain the impact of telecommunications on the business environment.
        2.3 Discuss the application of telecommunications in business communities and organizations.

3.0 Data communication codes and transmission media
        3.1 Explain different types of coding schemes.
        3.2 Describe Data Encoding Schemes.
        3.3 Explain decoding format, error checking, parities and control characters.
        3.4 Explain various transmission media types, including guided and unguided (microwave, satellite, and radio frequency).
        3.5 Explain the characteristics and functions of twisted pair, coaxial cable and fiber optics.
        3.6 Explain fiber optics transmission characteristics.
        3.7 Explain the various transmission impairments that affect the signal and the transfer rate.
        3.8 Define bandwidth and its relation to pulse width.
        3.9 Define frequency domain analysis.

4.0 Communication interfaces and modems
        4.1 Explain interfacing methods (i.e. modems and CSU/DSUs).
        4.2 Identify and explain different types of modulation techniques used today.

5.0 Communication networks
        5.1 Explain different network architectures.
        5.2 Discuss circuit switched and packet switched networks.
        5.3 Explain various topologies and configurations used in networks such as: Star, Ring, Bus and Tree.
        5.4 Explain Local Area Networks, their access methods and interconnection types.
        5.5 Give examples of LAN applications.
        5.6 Define and explain Wide Area Networks.
        5.7 Describe Cellular Communications
        5.8 Describe Satellite communication systems
        5.10 Explain channel capacity and its impact on data transmission.
        5.11 Explain data rate, and data transfer rate, and their effects on data transmission.
        5.12 Explain digital transmission systems, such as T-carrier and optical carrier (OC) networks.

6.0 Line sharing
        6.1 Discuss various multiplexing technologies.
        6.2 Explain major line sharing techniques (i.e. circuit sharing and packet sharing).

7.0 Protocols
       7.1 Describe the basic operation of common network protocols used in the OSI layers

8.0 Digital and analog signal transmission
       8.1 Describe digital signal transmission and encoding.
       8.2 Describe analog signal transmission and forms of encoding.
       8.3 Explain the difference between synchronous and asynchronous data transmission.

9.0 Communication Administration
       9.1 Describe ways that messages are routed within a network.
       9.2 Describe the functions of the network operation.
       9.3 Describe how network performance is monitored and measured.
       9.4 Explain the importance of system, network, and cyber security.
       9.5 List the common security threats to communication networks.
       9.6 Discuss the application of encryption to communications and system security.
       9.7 Discuss telecommunications polices and governance.

10.0 Internet Basics
       10.1 Explain Internet technology
       10.2 Explain Internet Protocol and services.
       10.3 Explain the features of client server computing.
       10.4 Explain the architecture of client server applications.

11.0 Internet Operation and Addressing
       11.1 Discuss Internet Addressing.
       11.2 Describe subnets and their usage.
       11.3 Discuss IP routing algorithms and protocols.
       11.4 Explain the role of subnet mask in IP addressing.

12.0 Digitizing grayscale and color images
       12.1 Describe the types of images.
       12.2 Describe brightness resolution.
       12.3 Describe spatial resolution.
       12.4 Describe the image digitization process.
       12.5 Identify tradeoffs involved in digitizing images.
       12.6 Perform calculations involving images.

13.0 Digital video
       13.1 Describe the process of creating digital video.
       13.2 Calculate the size of digital video files.

14.0. Digital Audio
       14.1 Describe the conversion of sound into electricity.
       14.2 Describe frequency, amplitude and phase.
       14.3 Perform calculations involving properties of sound waves.
       14.4 Describe multipliers for frequency and period.
       14.5 Define complex tones and pure tones.
       14.6 Describe frequency spectrum of audio signals.
       14.7 Describe the 3 steps for digitizing audio.
       14.8 Define Nyquist sampling theorem.
       14.9 Describe PCM.
       14.10 Describe Quantization error.

14.11 Describe construction of audio signals from binary streams.
14.12 Analyze tradeoffs involved in audio digitization.
14.13 Perform calculations involving digital audio files.

Required Time Allocation per Topic

In order to standardize the core topics of ITN 100 so that a course taught at one campus is equivalent to the same course taught at another campus, the following student contact hours per topic are required. Each syllabus should be created to adhere as closely as possible to these allocations. Of course, the topics cannot be followed sequentially. Many topics are taught best as an integrated whole, often revisiting the topic several times, each time at a higher level. There are normally 45 student-contact-hours per semester for a three credit course. (This includes 15 weeks of instruction and does not include the final exam week so 15* 3 = 45 hours. Sections of the course that are given in alternative formats from the standard 16 week section still meet for the same number of contact hours.) The final exam time is not included in the time table. The category, Other Optional Content, leaves ample time for an instructor to tailor the course to special needs or resources.

Topic	Time in Hours	Time Percentages
Communication systems and the OSI model	6	13%
The business environment	1	2%
Data communication codes and transmission media	4	9%
Communication interface and modems	2	4%
Communication networks	6	13%
Line sharing	2	4%
Protocols	3	7%
Digital and analog signal transmission	2	4%
Communication Administration	4	9%
Internet Basics	2	4%
Internet operation and addressing	2	4%
Digitizing grayscale and color images	2	4%
Digital video	2	4%
Digital Audio	2	4%
Other Optional Content	2	4%
Testing to include quizzes, tests, and exams (not including final exam)	3	7%
Total	45	100%