

ITT Technical Institute

IT344

Data and Network Communications

Onsite Course

SYLLABUS

Credit hours: 4

Contact/Instructional hours: 50 (30 Theory Hours, 20 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisite: IT220 Network Standards and Protocols or equivalent

Course Description:

This course examines various theoretical and technological foundations that enable data communications across networks. Focus will be on characteristics associated to the OSI model especially at the physical and data link layers, architecture, protocols and standards, and factors that affect the performance and efficiency of data networks.

Syllabus: Data and Network Communications

Instructor: _____

Office hours: _____

Class hours: _____

Major Instructional Areas

1. Theoretical and Technological Foundations of Data Networks
2. The OSI Model
3. Physical and Data Link Layers
4. Architecture, Protocols, Standards, and Factors
5. Performance and Efficiency of Data Networks

Course Objectives

1. Discuss the industry standards and practices involved in a data network.
2. Describe the role of protocol architecture in the OSI model.
3. Distinguish between the different methods of data transmission.
4. Analyze the theoretical and technological foundations in the operation of a data network.
5. Analyze the factors affecting the physical layer of the OSI model.
6. Analyze the factors affecting the data link layer of the OSI model.
7. Analyze the factors affecting the network layer of the OSI model.
8. Analyze the factors at the transport layer of the OSI model.
9. Contrast circuit and packet switching types of networks.
10. Explore the different components and types of switched networks.
11. Troubleshoot data networks for possible interruptions.
12. Distinguish between the methods used to control congestion in data networks.

SCANS Objectives

SCANS is an acronym for Secretary's Commission on Achieving Necessary Skills. The committee, created by the National Secretary of Labor in the early 1990s, created a list of skills and competencies that the committee feels are necessary for employees to function in a high-tech job market.

1. Identify relevant facts and analyze information in a logical manner after locating and verifying information using resources and computers.
2. Identify common goals and examine all possible options for problem solving.
3. Identify problems, create and implement solutions, and revise solutions, as required.
4. Allocate time and energy for completing projects in a timely manner.
5. Exert a high level of effort and perseverance toward attaining goals.
6. Recognize problems and devise and implement a plan of action.
7. Demonstrate the ability to utilize authentic resources available, including the Internet, knowledge libraries, or other sources.
8. Locate, understand, and interpret information obtained from a variety of sources.
9. Identify the need for data; select, retrieve, and analyze information; and communicate the results of information analysis in written, graphical, and pictorial formats.
10. Compare and contrast two theories or alternatives to arrive at the best solution.

11. Apply procedures, tools, and equipment—including computers and related technologies—whenever required.
12. Evaluate alternatives and choose the best for a situation.

Course Outline

Note: All graded activities, except the Project, are listed below in the pattern of <Unit Number>.<Assignment Number>. For example, Lab 2.1 refers to 1st lab activity in Unit 2.

Unit	Activities
1 Introduction to Networking Standards	<ul style="list-style-type: none"> • Content Covered: <i>Data and Computer Communications, 8/E:</i> <ul style="list-style-type: none"> ○ Chapter 1, “Data Communications, Data Networks, and the Internet,” pp. 10-31 ○ Chapter 2, Section 1, “The Need for a Protocol Architecture,” pp. 33-34 ○ Chapter 2, Section 2, “The TCP/IP Protocol Architecture,” pp. 34-42 ○ Chapter 2, Section 3, “The OSI Model,” pp. 42-44 ○ Chapter 2, Section 4, “Standardization within a Protocol Architecture,” pp. 44-48 • Labs: 1.1 • Project: Start • Assignments: 1.1
2 Data Transmission and Transmission Media	<ul style="list-style-type: none"> • Read from <i>Data and Computer Communications, 8/E:</i> <ul style="list-style-type: none"> ○ Chapter 3, Section 1, “Concepts and Terminology,” pp. 67-78 ○ Chapter 3, Section 2, “Analog and Digital Data Transmission,” pp.78-86 ○ Chapter 3, Section 3, “Transmission Impairments,” pp. 86-91 ○ Chapter 3, Section 4, “Channel Capacity,” pp. 91-96 ○ Chapter 4, Section 3, “Wireless Propagation,” pp. 125-129 ○ Chapter 6, Section 1, “Asynchronous and Synchronous Transmission,” pp. 182-186 ○ Chapter 6, Section 2, “Types of Errors,” p. 186 ○ Chapter 6, Section 5, “Line Configurations,” pp. 201-203 • Labs: 2.1 • Project Part 1: Submit • Assignments: 2.1
3 Data Communications	<ul style="list-style-type: none"> • Read from <i>Data and Computer Communications, 8/E:</i> <ul style="list-style-type: none"> ○ Chapter 8, Section 1, “Frequency Division Multiplexing,” pp. 242-248 ○ Chapter 8, Section 2, “Synchronous Time Division Multiplexing,” pp. 248-258 ○ Chapter 13, Section 6, “ATM Traffic Management,” pp. 394-406 ○ Chapter 18, Section 1, “Basic Protocol Functions,” pp. 558-565

Unit	Activities
	<ul style="list-style-type: none"> ○ Chapter 20, Section 1, "Connection-Oriented Transport Protocol Mechanisms," pp. 657-674 ● Quizzes: 3.1 ● Labs: 3.1 ● Project Part 2: Submit ● Assignments: 3.1
4 Physical Layer	<ul style="list-style-type: none"> ● Read from <i>Data and Computer Communications, 8/E</i>: <ul style="list-style-type: none"> ○ Chapter 4, Section 1, "Guided Transmission Media," pp. 104-116 ○ Chapter 15, Section 2, "Topologies and Transmission Media," pp. 451-457 ○ Chapter 16, Section 3, "Fibre Channel," pp. 500-504 ○ Chapter 17, Section 3, "IEEE 802.11 Architecture and Services," pp. 531-535 ○ Chapter 17, Section 5, "IEEE 802.11 Physical Layer," pp. 543-549 ● Labs: 4.1 ● Project Part 3: Submit ● Assignments: 4.1
5 Data Link Layer	<ul style="list-style-type: none"> ● Read from <i>Data and Computer Communications, 8/E</i>: <ul style="list-style-type: none"> ○ Chapter 7, Section 3, "High-Level Data Link Control (HDLC)," pp. 222-228 ○ Chapter 7, Appendix 7A, "Performance Issues," pp. 232-238 ○ Chapter 15, Section 3, "LAN Protocol Architecture," pp. 457-465 ○ Chapter 16, Section 1, "The Emergence of High-Speed LANs," pp. 483-485 ○ Chapter 16, Appendix 16A, "Digital Signal Encoding for LANs," pp. 508-514 ○ Chapter 17, Section 4, "IEEE 802.11 Medium Access Control," pp. 535-543 ● Labs: 5.1 ● Project Part 4: Submit ● Assignments: 5.1
6 Network Layer	<ul style="list-style-type: none"> ● Read from <i>Data and Computer Communications, 8/E</i>: <ul style="list-style-type: none"> ○ Chapter 18, Section 3, "Internet Protocol Operation," pp. 569-576 ○ Chapter 19, Section 1, "Multicasting," pp. 605-614 ○ Chapter 19, Section 2, "Routing Protocols," pp. 614-625 ○ Chapter 19, Section 3, "Integrated Services Architecture," pp. 625-636 ○ Chapter 19, Section 4, "Differentiated Services," pp. 636-645 ○ Chapter 19, Section 6, "IP Performance Metrics," pp. 646-649 ● Labs: 6.1 ● Project Part 5: Submit ● Assignments: 6.1

Unit	Activities
7 Transport Layer	<ul style="list-style-type: none"> • Read from <i>Data and Computer Communications, 8/E</i>: <ul style="list-style-type: none"> ○ Chapter 18, Section 2, “Principles of Internetworking,” pp. 566-569 ○ Chapter 20, “Transport Protocols,” pp. 655-694 • Quizzes: 7.1 • Labs: 7.1 • Project Part 6: Submit • Assignments: 7.1
8 Switching	<ul style="list-style-type: none"> • Read from <i>Data and Computer Communications, 8/E</i>: <ul style="list-style-type: none"> ○ Chapter 10, “Circuit Switching and Packet Switching,” pp. 297-323 ○ Chapter 11, “Asynchronous Transfer Mode,” pp. 328-348 ○ Chapter 12, “Routing in Switched Networks,” pp. 351-372 • Labs: 8.1 • Project Part 7: Submit • Assignments: 8.1
9 Network Management	<ul style="list-style-type: none"> • Read from <i>Data and Computer Communications, 8/E</i>: <ul style="list-style-type: none"> ○ Chapter 22, “Internet Applications—Electronic Mail and Network Management,” pp. 743-770 • Labs: 9.1 • Project Part 8: Submit • Assignments: 9.1
10 Controlling Networks	<ul style="list-style-type: none"> • Read from <i>Data and Computer Communications, 8/E</i>: <ul style="list-style-type: none"> ○ Chapter 7, Section 1, “Flow Control,” pp. 209-216 ○ Chapter 7, Section 2, “Error Control,” pp. 216-221 ○ Chapter 13, Section 1, “Effects of Congestion,” pp. 379-383 ○ Chapter 13, Section 2, “Congestion Control,” pp. 383-386 ○ Chapter 13, Section 3, “Traffic Management” pp. 386-387 • Quizzes: 10.1 • Labs: 10.1 • Project Part 9: Submit • Assignments: 10.1
11 Course Review and Final Exam	<ul style="list-style-type: none"> • Course Review • Final Exam • Course Project: Submit and Presentation

Instructional Methods

The curriculum is designed to promote a variety of teaching strategies that support the outcomes described in the course objectives and foster higher cognitive skills.

Multiple styles will be used to deliver content and inspire and engage you such as lectures, collaborative learning options, and hands-on laboratory activities. Your progress will be regularly assessed using

various accessible methods and tools. Classroom activities will bridge the transition from theory to laboratory exercise.

Instructional Materials and References

Student Textbook Package

- Stallings, William. *Data and Computer Communications*, 8th Ed. Upper Saddle River, NJ: Prentice Hall, 2007.

Equipment and Tools

- Removable hard drive
- Required software (including operating systems and tools) will be provided by your instructor for in-lab installation.

References

ITT Tech Virtual Library

Log on to the ITT Tech Virtual Library at <http://www.library.itt-tech.edu/> to access online books, journals, and other reference resources selected to support ITT Tech curricula.

Books

You may click “Books” or use the “Search” function on the home page to find the following book:

- ITT Tech Virtual Library> Main Menu> Books> Books24x7> Prasad K.V. *Principles of Digital Communication Systems and Computer Networks*. Hingham, MA: Charles River Media, 2003.

Program Links

You may click “Program Links” or use the “Search” function on the home page to find the following program links:

ITT Tech Virtual Library> Main Menu> Program Links>
Data Communication Systems Technology (DCST)> Professional Organizations>

- Association for Computing Machinery
- Association of Information Technology Professionals
- Association of Internet Professionals
- Computer Security Institute
- IEEE Computer Society
- Information Technology Association of America
- Internet Society
- Network and Systems Professionals Association
- Network Professional Association
- Project Management Institute
- Women in Technology International (WITI)

Other References

The following resources can be found **outside** of the ITT Tech Virtual Library, whether online or in hard copy.

Periodicals

- Network Computing
<http://www.networkcomputing.com/>

Websites

- Technical Resources and Course Web Site for *Data and Computer Communications, 8/E*
<http://www.williamstallings.com/DCC/DCC8e.html>
- Website for William Stallings' books
<http://www.williamstallings.com/index.html>

All links to Web references outside of the ITT Tech Virtual Library are always subject to change without prior notice.

Course Evaluation and Grading

Evaluation Criteria

The final grades will be based on the following categories:

CATEGORY	WEIGHT
Assignments	20%
Quizzes	10%
Labs	25%
Project	25%
Final Exam	20%
Total	100%

Grade Conversion Table

The final grades will be calculated from the percentages earned in the course, as follows:

A	90–100%	4.0
B+	85–89%	3.5
B	80–84%	3.0
C+	75–79%	2.5
C	70–74%	2.0
D+	65–69%	1.5
D	60–64%	1.0
F	<60%	0.0

(End of Syllabus)