



NEW YORK CITY COLLEGE OF TECHNOLOGY

Electromechanical Engineering Technology | Course Outline

Course: EMT 2455: Data Communications

Course Coordinator: Prof. Xiaohai Li, PhD.

Revised on: Fall 2019

Credits: 2 **This course is:** Required Elective Selective Elective

Contact Hours: 3 **Class Hours:** 1 **Lab Hours:** 2 **Ind. Study Hours:** 0 **Internship Hours:** 0

Catalog Description:

Fundamentals of data communications and computer networks protocols and standards. It provides a basic understanding of data communication systems with practical examples of communication networks as applied in engineering technology. Study of OSI and TCP/IP models, data transmissions, transmission media, network topologies, network cabling system, IP addressing, TCP/IP suite, local area networks (LANs), wide area networks (WANs), wireless network, and network security. Students carry out experiments using modern hardware and software networking tools.

Pre-Requisites: EMT 1250, EMT 2370

Co-Requisites: N/A

Required Texts [Title. Authors. Publisher. Year.]

1. **Data Communications and Networking, 5th Ed.** Behrouz A. Forouzan McGraw-Hill. ISBN10: 007337622, ISBN13: 9780073376226, 2013.

Other Suggested Reference or Supplemented Material

1. **Computer Networks (5th Edition).** Andrew S. Tanenbaum and David J. Wetherall. Prentice Hall. ISBN-10: 0132126958, ISBN-13: 978-0132126953, 2010.
 2. **Computer Networks and Internet (5th Edition).** Douglas E. Comer. Prentice Hall, ISBN-10: 0136066984, 2009.
 3. **Computer Networking: A Top-Down Approach (5th Edition).** James F. Kurose and Keith W. Ross. Addison Wesley, ISBN-10: 0136079679, 2009.
 4. **Computer Networks: A Systems Approach (5th Edition).** Larry L. Peterson and Bruce S. Davie. The Morgan Kaufmann Series in Networking, ISBN-10: 0123850592, 2011.
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Course Learning Outcomes

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

1. Understand TCP/IP and ISO OSI reference model of computer networks
2. Understand the principle of packet switching, encapsulation and decapsulation
3. Understand the backbone of the Internet
4. Understand and recognize network topologies of LANs
5. Know different types of physical media of computer networks
6. Understand fundamental networking devices for a home wired and wireless network
7. Know the basics of Fourier analysis and signal frequency spectrum
8. Understand multiplexing, bandwidth, analog transmission and modulation
9. Understand Nyquist bit rate and Shannon capacity
10. Understand basic components of a structured cabling system.
11. Understand the fundamentals of Ethernet (protocol, Ethernet frame, MAC address) and be familiar with the technical aspects of Ethernet twisted pair cables (balanced mode, categories, straight through and crossover cables).

12. Understand the basics of IP addressing

General Education Outcomes

SKILLS/Inquiry/Analysis: Employ scientific reasoning and logical thinking.

INTEGRATION/Information Literacies/: Gather, interpret, evaluate, and apply information discerningly from a variety of sources.

KNOWLEDGE/Lifelong learning/Acquire tools for lifelong learning—how to learn, how they learn, knowledge of resources.

Student Outcomes listed in the ETAC/ABET Criterion 3 Addressed in this Course

Student Outcomes	Level
1. An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve well-defined engineering problems appropriate to the discipline;	I
2. An ability to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;	
3. An ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;	R
4. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results;	R
5. An ability to function effectively as a member of a technical team;	

Legend: I (Introduce), R (Reinforce) and E (Emphasize). Unmarked means not addressed.

Brief list of topics to be covered

Week 1~3	Course Introduction, Ch.1 – Introduction 1.1: Introduction to data communications and computer networks, ISO OSI Reference and TCP/IP models 1.2: History of the Internet 1.3: Services over the Internet and their structures, introduction to cloud computing and service model of cloud computing
Week 4	1.4. Packet switching, encapsulation and decapsulation
Week 5	Ch.2 – Physical Layer 2.1. Network topology, transmission media (twisted pair, coaxial, fiber optic), fiber optical communication
Week 6	2.2. Simplex, duplex and multiplexing; Structured cabling system; Introduction to networking devices; Set up a wired and wireless network at home
Week 7	2.3. Internet Backbone
Week 8, 9	2.4 Signal and signal transmission: Analog and digital signals, composite signal, frequency, Fourier analysis and frequency spectrum, frequency domain analysis, bandwidth, baseband and broadband, modulation, SNR, Nyquist bit rate, Shannon capacity
Week 10,11	Ch.3 – Data Link Layer & Ethernet: Ethernet protocol, Ethernet frame definition, MAC address, CRC algorithm, Ethernet over twisted pair (standards, cable categories, color code, straight-through and crossover, PoE, termination)
Week 12	Ch.4 – IP Addressing
Week 13	Ch.5 – Wireless Networking: Standards and tech specifications, wireless networking devices, WLAN configuration and analysis
Week 14	Ch.6 – Introduction to Network Security
Week 15	Final Exam