

Université d'Ottawa
Faculté de génie

École d'ingénierie et de
technologie de l'information



uOttawa

L'Université canadienne
Canada's university

University of Ottawa
Faculty of Engineering

School of Information
Technology and Engineering

SEG3155 - 3
COMMUNICATION AND NETWORKING (3, 1.5, 1.5)
Winter 2012

Instructor: Jiyong Zhao
Office: STE 5019
Office Hour: 10:00 to 12:00 on Fridays
Schedule: to be finalized.

Phone/Voice Mail: 6667
E-Mail: jyzhao@site.uottawa.ca

CALENDAR DESCRIPTION

Basics of information theory. Communications concepts: Fourier transforms, signal analysis. Protocols. The OSI reference model. Data transmission: analog-digital conversion, channel capacity, bandwidth, signal encoding, transmission media. Error detection and correction. Flow control; error control. Data link layer protocols and multiplexing. Medium Access Control; LAN architectures. Circuit vs. packet switching. Network layer. Congestion control and traffic management. TCP/IP.

COURSE/LEARNING OUTCOMES

- To acquire an appreciation of modern data communication techniques used in the physical, data link, and network layers of the ISO reference model.
- To acquire an ability to analyze properties of computer networks and communication protocols.

PREREQUISITES

MAT2377 (Probability and Statistics for Engineers) or (MAT2371 (Introduction to Probability) and MAT2375 (Introduction to Statistics)).

REQUIRED TEXTS/MATERIALS

William Stallings, *Data and Computer Communications*, 9th edition, Prentice-Hall, 2011. Earlier editions can be used if a student already has one of them. However it is the student's responsibility to check the differences.

RECOMMENDED TEXTS/MATERIALS

Three books that are recommended and that will be on reserve in the university library, are:

1. Andrew Tanenbaum, *Computer Networks*, 4th edition, Prentice-Hall, 2003, ISBN: 0-13-066102-3.
2. Fred Halsall, *Data Communications, Computer Networks and Open Systems*, 4th edition, Addison-Wesley, 1998, ISBN: 0-201-42293-X.
3. Douglas Comer, *Internetworking with TCP/IP: Principles, Protocols, and Architectures*, 4th edition, Prentice-Hall, 2000, ISBN: 0-13-018380-6.

STUDENT EVALUATION

Assignments (4)	20 %
Labs (4)	15 %
Mid-term	20 %
Final Exam	45 %

Midterm will be closed book and based on the topics that have been covered up to the midterm date.

Final exam will be closed book and based on all topics listed in the Course Outline.

Notes:

- The percentage from the exams are calculated as follows:

$$x = \left(\frac{m}{M} \times 20 + \frac{f}{F} \times 45 \right) \div 65 \times 100\%$$

where ***m*** and ***f*** are respectively the mark for the midterm and final exam, while ***M*** and ***F*** are respectively the allocation (maximum marks possible) for the midterm and final exam.

- According to a standard rule, the marks for the assignments will not be counted if ***x*** is below 50%.
- All assignments and lab reports should be handed-in on time. Late submissions will be marked as 0.

SYLLABUS

1. Data communications and networking overview (Chapter 1) **0.5 week**
Communications model, data communications, data communication networking.
2. Protocol architecture (Chapter 2) **0.5 week**
Introduction to protocol architecture, OSI layers, TCP/IP protocol architecture.
3. Data transmission (Chapter 3) **1 week**
Concepts and terminology, introduction to Fourier transform and signal analysis, analog and digital data transmission, transmission impairments, channel capacity.
4. Guided and wireless transmissions (Chapter 4) **0.5 week**
Guided transmission media, wireless transmission and propagation, line-of-sight transmission.
5. Signal encoding techniques (Chapter 5) **1 week**
Digital data to digital signals, digital data to analog signals, analog data to digital signals, analog data to analog signals.
6. Digital data communication techniques (Chapter 6) **1 week**
Asynchronous and synchronous transmission, type of errors, error detection, error correction, line configuration, interfacing.

7. Data link control (Chapter 7) **1 week**
Flow control, error control, HDLC.
8. Multiplexing (Chapter 8) **0.5 week**
Frequency division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, asymmetric digital subscribe line, xDSL.
9. Local area network overview and high-speed LANS (Chapters 15 & 16) **1.5 weeks**
Topologies and transmission media, LAN protocol architecture, bridges, switches. Ethernet, token ring, fiber channel.
10. Circuit switching and packet switching (Chapter 10) **1 week**
Switching networks, circuit-switching network and concepts, packet-switching principles, X.25, frame relay.
11. Congestion control in data networks (Chapter 13) **1 week**
Effects of congestion, congestion control, traffic management.
12. Internetwork protocols (Chapter 18) **1.5 weeks**
TCP architecture and OSI, basic protocol functions, principles of internetworking, connectionless internetworking, internet protocol (IPv4, ARP, ICMP), IPv6, TCP.
13. Routing and routing protocols (Chapters 12 & 19) **1 week**
Routing in packet-switching networks, least-cost algorithms. Routing protocols (RIP, OSPF, BGP).
14. Other topics and reviews **1 week**
Concepts of ATM, spread spectrum, cellular communication, and wireless LANs.