

CMPG315 - Computer Networks

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Study Unit 1

Introduction to Networks

Outcomes:

- Describe the use of computer networks;
- Describe the different types of networks;
- Discuss the layered architecture of computer networks;
- Describe and compare the OSI and TCP/IP reference models;
- Describe the protocols of the OSI and TCP/IP reference models; and
- Describe the Internet network as example.

Study Unit 2

The Physical Layer

Outcomes:

- Know the expression of the Fourier series;
- Interpret the Fourier analysis on the basis of a diagram;
- Calculate the maximum data tempo of a channel with and without noise;
- Describe and compare the different transmission media;
- Describe the attenuation and distortion of signals;
- Describe the structure of the public telephone system;
- Describe the operation of a modem as well as the different modulation techniques;
- Describe the different methods of multiplexing;
- Describe the different switching techniques;
- Give an overview of the mobile telephone system;
- Describe and compare baseband and broadband;
- Describe and compare synchronous and asynchronous transmission; and
- Describe different encoding methods.

Study Unit 3

The Data Link Layer

Outcomes:

- Describe the different services that the data link layer offers to the network layer;
- Describe the different framing techniques;
- Describe error recovery and error detection codes;
- Indicate how the Hamming code can recover an error;
- Indicate how the cyclic redundancy check can be used to detect an error in a given frame with a given generator polynomial; and
- Describe and analyse the different data link layer protocols.

Study Unit 4

The Media Access Control Sublayer

Outcomes:

- Describe both static and dynamic allocation of channels;
- Discuss the five key assumptions on which dynamic channel allocation is based;
- Describe the ALOHA, CSMA, and CSMA/CD protocols; and
- Describe Ethernet or IEEE 802.3 as an example of CSMA/CD.

Study Unit 5

The Network Layer

Outcomes:

- Describe the design of the network layer;
- Describe the storage and forwarding of packets through a network;
- Describe the services rendered by the network layer;
- Describe the implementation of both connectionless and connection-oriented services;
- Describe and compare virtual circuit and datagram subnets;
- Discuss the different ways in which routing algorithms can be classified;
- Describe shortest-path routing and overflowing and apply these to a given network problem; and
- Describe Dijkstra's algorithm as well as Ford and Fulkerson's algorithm and solve a given problem with these.

Study Unit 6

The Transport Layer

Outcomes:

- Describe the services provided to the higher layers;
- Describe the Berkeley sockets;
- Describe the different elements of transport protocols;
- Describe a simple transport protocol; and
- Discuss the different aspects around network performance.

Study Unit 7

The Application Layer

Outcomes:

- Describe the operation of the Domain Name System; and
- Describe the operation of the email system.

Study Unit 8

Security

Outcomes:

- Describe the problems around network security;
- Describe the operation of the cryptographic algorithms;
- Discuss the necessity of digital signatures;
- Describe the different methods of digital signatures and their weaknesses/shortcomings;
- Describe methods to ensure that information can be transferred without interception;
- Describe how the identity of communicating parties can be verified;
- Describe how email can be safeguarded; and
- Discuss social aspects around the use of the Internet.