

# COMPUTER NETWORKS

FACULTY OF INFORMATION TECHNOLOGY I

## General information

### ➤ Website:

- <https://tinyurl.com/mmtptit2024>  
(Computer Networking folder)

### ➤ Textbook and documents:

- English:
  - J. F. Kurose and K. W. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet (8nd edition)*, Pearson, 2020.
  - Slides (from lecturer)
- Vietnamese:
  - Slides: <https://tinyurl.com/mmtptit2024> (Mạng máy tính folder)
  - Nguyễn Xuân Anh, *Bài giảng Mạng máy tính*, Học viện CN BCVT.
  - Nguyễn Thúc Hải, *Mạng máy tính và các hệ thống mở*, Nhà xuất bản giáo dục.

## Objectives

### ➤ Theory

- The structure and elements of the Internet
- The layers in the TCP/IP model and protocols, respectively.
- Network performance

### ➤ Practice

- Practice with some simple network utility tools.
- Understand about TCP/IP and network terminology

### ➤ Approach

- Top-down: from Application layer to Datalink layer
- Use Internet as an example

## Organization

### ➤ Subject consists of

- Lectures + Assignments
- Practice
- One main assignment (maybe)

### ➤ For students

- Report/Present all assignments

## Grade components

### ➤ Grade components as follows:

- Attendance + learning attitude in class: 10% (*Check attendance and test in the learning process*)
- Mid-term test (~4 times), a main assignment (maybe): 20%
- Practice: 10%
- Final exam: 60%

## Chapter 1: Introduction to the Internet

### 1.1. Basic concepts

- 1.1.1. The Internet
- 1.1.2. Protocol
- 1.1.3. The network edge: access networks, physical media
- 1.1.4. The network core: packet switching, circuit switching, internet structure

### 1.2. Delay, Packet loss and Throughput

### 1.3. Protocol layers and Service models

- 1.3.1. Layered architecture
- 1.3.2. Data encapsulation

### 1.4. Network security

### 1.5. History

## Chapter 2: Application Layer

### 2.1. Principles of network applications

- 2.1.1. Network application architectures
- 2.1.2. Communicating between processes
- 2.1.3. Transport services

### 2.2. The Web and HTTP

### 2.3. FTP

### 2.4. Electronic mail

### 2.5. DNS (Domain Name Systems)

### 2.6. Peer-to-peer applications

### 2.7. Video streaming and content distribution networks

### 2.8. Creating simple network applications by Socket programming

## Chapter 3: Transport Layer

### 3.1. Transport layer services

### 3.2. Multiplexing and demultiplexing

### 3.3. UDP: connectionless transport

### 3.4. Principles of Reliable data transfer

- 3.4.1. Building a Reliable data transfer protocol
- 3.4.2. Pipeline protocols: Go-Back-N and Selective repeat

### 3.5. TCP: connection-oriented transport

- 3.5.1. The TCP connection
- 3.5.2. Structure of TCP segment
- 3.5.3. Estimating Round-trip-time and Timeout
- 3.5.4. Reliable data transfer
- 3.5.5. Flow control
- 3.5.6. TCP connection management

### 3.6. Principles of Congestion control and TCP congestion control

- 3.6.1. Principles of Congestion control
- 3.6.2. TCP congestion control

## Chapter 4: Network Layer

- 4.1. Network layer service models
- 4.2. Architecture of a Router
- 4.3. The Internet protocol (IP): IPv4 and IPv6
  - 4.3.1. Structure of IPv4 datagram
  - 4.3.2. IPv4 Addressing
  - 4.3.3. NAT: Network address translation
  - 4.3.4. IPv6
- 4.4. Routing algorithms
  - 4.4.1. Link-state
  - 4.4.2. Distance-vector
- 4.5. Routing on the Internet: RIP, OSPF, BGP

## Chapter 5: Datalink Layer and LANs

- 5.1. Link layer services
- 5.2. Error-detection and Error-correlation techniques
- 5.3. Multiple access links and protocols
  - 5.3.1. Channel partitioning protocols
  - 5.3.2. Random access protocols
  - 5.3.3. Taking-turns protocols
- 5.4. Switched local area networks
  - 5.4.1. Link layer addressing and ARP
  - 5.4.2. Ethernet
  - 5.4.3. Link layer switches
- 5.5. Data center networking
- 5.6. Summary: A cycle of a Web page request