Chapter 1 Introduction

- What is Internet:
  - A nuts-and-bolts view
  - A service view
- Network edge:
  - Devices
  - Access networks
  - Physical media: Guided vs Unguided
- Network core:
  - Circuit switching, TDM, FDM
  - Packet switching, Store and forward
  - (message switching)
  - Internet structure
- Delay, loss, throughput
- Protocol stacks:
  - Protocol model of Internet
  - OSI model
  - Protocol data units
  - Encapsulation & Decapsulation

Chapter 2 Application Layer

- Principles of network applications
  - Architecture: Client server vs P2P
  - Process, Socket, IP, port number
  - TCP service vs UDP service
- Web & HTTP
  - HTTP protocol,
  - HTTP connection: Persistent HTTP & Non-persistent HTTP, pipelining
  - Cookies
  - Web cache
- EMAIL
  - SMTP vs. HTTP
  - Mail access protocols: POP3, IMAP
- DNS
  - Service, structure
  - DNS records
  - Name resolution, iterated query vs. recursive query

Chapter 3 Transport Layer

- Transport-layer services, TCP vs UDP
- Multiplexing & demultiplexing
- UDP
- Reliable data transfer:
  - handle errors: error detection and feedback, stop and wait
  - handle duplicates:, seq number
  - handle loss: timeout, pipelining, Go-back-N vs. Selected repeated
- TCP:
  - segment structure, seq#, timer, RTT, ACK
  - retransmission, fast retransmit
  - flow control
  - 3-way handshake
- congestion control principles
  - Cause & cost
  - Approaches: end-end vs network assisted congestion control
- TCP congestion control:
  - AIMD
  - slow start, congestion avoidance, fast recovery
  - TCP Tahoe, TCP Reno

Chapter 4: network layer – data plane

- Network layer
  - Functions, data plane, control plane
  - Services, best-effort
- Router:
  - Architecture and functions, longest prefix match
  - buffer management
  - Pkt Scheduling: FCFS, Priority, Round-bin, WFQ
- Internet Protocol/IP
  - datagram format
  - Addressing, IP address, interface, subnet, CIDR
  - DHCP
- NAT: network address translation
- IPv6, tunneling and encapsulation

Chapter 5: network layer – control plane

- routing protocols
  - link state
  - distance vector
- intra-ISP routing:
  - RIP, EIGRP
  - OSPF
- Inter-ISP routing: BGP
- Internet Control Message Protocol

Chapter 6 data link layer

- Link layer services
- error detection & correction
  - Parity checking, checksum, CRC
- multiple access links & protocols
  - Channel partition: TDMA, FDMA
  - Random access:
    - Slotted ALOHA, pure ALOHA
    - CSMA, CSMA/CD
  - Taking turns
- LANs
  - MAC address
  - Address resolution protocols: ARP
  - Ethernet:
    - topology
    - frame structure
    - Services
    - Standards
    - Hub, switch, router