Review for Midterm Exam

- **Coverage:**
    - **Textbook reading assignments**
    - **Lectures: #1 – 19**
    - **Self-check exercises: Weeks #1 - 5**
    - **Quiz #1**
    - **Labs #1 – 3**
- **NOT covered:**
    - **Programming Project**
    - **Socket programming**
- **40% multiple-choice, 60% short-answer**
- **Calculator permitted**

Midterm exam topics

- Fundamentals
  - Terms, acronyms, etc.
  - Hardware
    - Modem, router, etc.
    - Physical media
      - Guided, unguided
  - Network / Internet
    - Structure, functions
  - Core, edge, access
  - Protocols, standards, RFCs
  - Packet switching, circuit switching
  - **Multiplexing**
    - **frequency-division, time-division, statistical**
  - Encapsulation
  - Software
  - **Layering models**
    - **ISO, Internet protocol stack**

Midterm exam topics

- Issues
  - Complexity
    - Communication among variety of hardware/software/standards
    - Two Generals (problem)
    - Trade-offs
  - **Security**
    - **intentional/unintentional attacks**
  - Management
    - Hierarchy, service providers
  - Global authority
    - ICANN, InterNIC, IETF
  - Growth
    - economic impact

Midterm exam topics

- Metrics (usually include calculations)
  - Bandwidth
  - **Delay (queuing, processing, transmission, propagation, end-to-end)**
  - **RTT**
  - **Throughput**
    - **instantaneous, average**
  - **Utilization**
  - **Size: Ki, Mi, Gi (B)ytes, (b)its, etc.: powers of 2**
  - **Speed: K, M, G bps, etc.: powers of 10**

Midterm exam topics

- Applications
  - ping, traceroute, telnet, etc.
  - web, email, ftp, audio/video streaming, etc.
- Application layer
  - **Client-server, P2P models**
  - Protocols
    - **HTTP**
      - Persistent, non-persistent
      - **Cookies, caches, proxies**
    - **Mail**
      - **Sending: SMTP, MIME**
      - **Access: POP, IMAP, HTTP**
    - FTP
    - **DNS**
      - **Naming, URL**
      - **IP address**

Midterm exam topics

- Transport layer
  - **Ports, sockets, socket addressing**
  - Protocols
    - **UDP (unreliable, connectionless)**
    - **TCP (reliable, connection-oriented)**

- UDP
  - **Application layer protocols that use UDP**
  - **Error detection**
    - **Checksum (only)**
  - Error handling
    - Discard

Midterm exam topics

- **TCP**
  - **Segment structure**
    - **Header**
    - **Connection identification**
    - **Sequence numbers (byte stream)**
    - **Acknowledgement, retransmission**
      - **Transmission diagrams**
  - **Application layer protocols that use TCP**

Midterm exam topics

- **TCP**
  - **Reliable data transfer**
    - **Pipelining**
    - **Flow control (sliding window)**
    - **Error detection**
      - **Checksum**
      - **Timeout**
      - **Packet delay/loss**
      - **Acknowledgement delay/loss**
    - **Error handling**
      - **Cumulative acknowledgements**
      - **Selective retransmission**
        - **Timing diagrams**
        - **Retransmission scenarios**
      - **Fast retransmission**

- **UDP/TCP comparisons**