Most of the final test will be on the part after the midterm test. However, you should also be familiar with the fundamentals covered before the midterm. The materials of the textbook were not uniformly discussed; some parts were discussed in details with extra contents/examples and other parts were not. Please refer the course notes posted at CourseCentral and the notes taken at class for details. I expect your comprehensive understanding of the materials listed in the summary.

- **Internet basics (Chapters 1-4)**
  - Network type, TCP/IP Internet, network level services and property.
  - Ethernet, connect LANs by bridges.
  - Internetworking, goal and approaches of interconnection.
  - Protocols and layered structure, TCP/IP model, OSI model.

- **Internet Protocol (Chapters 5,7-9)**
  - Internet addressing, IPv4 address, IPv4 subnet addressing, IPv4 classless addressing, design IPv4 subnets address, IPv6 address, IPv6 address types and hierarchy, IPv6 interface identifier,
  - Internet protocol, IPv4 datagram, IPv6 datagram, IPv6 extension headers, IPv4 fragmentation and reassembly, IPv6 fragmentation and reassembly.
  - Forwarding IP datagrams, direct forwarding, indirect forwarding, table driving delivery, routing table, IP forwarding algorithm, efficient address lookup.
  - ICMP, ICMP messages, format, and delivery.

- **Address resolution, DHCP, NDP, DNS (Chapters 6,22,23)**
  - Address resolution, dynamic binding, ARP, ARP message and format, RARP.
  - DHCP, dynamic IP address assignment, address acquisition states, DHCP message and format. Managed and unmanaged configuration, Neighbor Discovery Protocol (NDP), ICMPv6 messages.
  - Domain Name System (DNS), domain name space, Internet domain names, mapping between domain names and IP addresses, DNS servers.

- **UDP and TCP (Chapters 10,11)**
  - UDP, service property, protocol port, UDP message and format.
  - TCP, service property, techniques for reliability and stream oriented delivery, segment and format, TCP sliding window, timeout and retransmission, response to congestion, connection issues.

- **Interior/Exterior Routing Protocols (Chapters 12-14,16)**
  - Routing table, distance-vector routing, link-state routing, autonomous system.
Interior routing, routing information protocol (RIP), routing table update, Open SPF protocol (OSPF), graph expression for AS.
Exterior routing, BGP, path vector routing.
IP switching, flow label, speed up in table look up, MPLS.

- Multicast (Chapter 15)
  Concept of multicast, multicast on Ethernet.
  IP multicast, IPv4 and IPv6 multicast addresses, mapping IPv4 and IPv6 multicast addresses to Ethernet multicast address, multicast delivery.
  Internet group management protocol (IGMP), IGMP operation, IGMP messages.
  Basic techniques in multicast routing, reverse path forwarding, truncated reverse path forwarding.
  Multicast tree, broadcast tree, prune and grift.

- Network virtualization (Chapter 19)
  Technologies for network virtualization, virtual private networks (VPNs), network address translations (NATs), overlay networks.
  Basic technologies for VPNs, VPN tunneling and IP-in-IP encapsulation, VPN addressing and forwarding.
  NAT technologies, NAT translation table and table initialization, other issues with NAT.

- Internet security (Chapter 29)
  Security issues, encryption/decryption, secret key encryption, substitution and transposition encryption schemes, stream encryption scheme, public key encryption, RSA, combination of secret key and public key encryptions.
  Digital signature, public key encryption for signature, signing the digest.
  Internet security, application layer security, PGP, transport layer security, IPsec, AH protocol, ESP protocol.
  Firewalls, packet filtering, proxy system.