

Final Exam Review

- Weight: 20% of course grade
- Format:
 - ~80% multiple-choice questions
 - ~20% free-response questions
- Proctored
 - Bring:
 - One note page (standard 8.5" x 11", 2-sided)
 - Calculator

Exam content

- Emphasis on material covered after Midterm (90%)
 - Reading assignments
 - Lectures
 - Self-evaluation exercises
 - Labs
 - Project
 - Quiz
- General coverage of earlier topics (10%)

Topics: Fundamentals and Metrics

- Encapsulation
- Segment/datagram/frame/packet
- Routing/forwarding
- Reliable data transport, best-effort delivery

- Utilization
- Effective delay
- RTT, RTD
- MSS
- MTU

Topics: Application Layer

- Application Layer
 - Abstraction: client/server, peer-peer
 - General coverage (responsibilities, etc.)

Topics: Transport Layer

- Abstraction: process-to-process
- General coverage (responsibilities, etc.)
- Congestion
 - Causes/consequences
 - Detection/control/avoidance/reaction/collapse
 - Adaptive transmission algorithm
 - AIMD, slow-start
 - Setting timeout
 - Samples/estimates, history
 - Sliding/congestion window
 - advertisement/size
- Handshake/ connection, close
- Compare/contrast TCP/UDP

Topics: Network Layer

- Abstraction: host-to-host
- General coverage (responsibilities, etc.)
- Service models
 - Datagram, virtual circuit
- Route computation (shortest path)
 - Model: graph/nodes/edges
 - Dijkstra's Algorithm
- Routing tables (forwarding tables)
 - First hop

Topics: Network Layer Internet Protocol (IPv4)

- Datagrams
 - Content, format, size, etc.
- Datagram forwarding
- Internet addresses
 - Global management
 - Local management
 - Format, notations
- Classless Inter-Domain Routing (CIDR)
 - Prefix (network), suffix (host)
 - Netmasks, network address/host number
 - Addressing hierarchy
 - Subnetting

Topics: Network Layer

Internet Protocol (IPv4)

- DHCP
- Fragmentation
 - Path MTU
 - Implementation: identification, sequence numbers
 - Overhead calculation
 - Fragmenting fragments
 - Defragmentation, re-assembly
 - Fragment loss
- ICMP
 - Applications (ping, traceroute, router/MTU discovery, etc.)
- NAT
 - Configuration, tables
 - Address/port substitution
 - Overhead

Topics: Network Layer

- IPv6
 - Address format/notation
 - Compare/contrast IPv4/IPv6
 - Fragmentation, headers, etc.
 - Transition from IPv4

Topics: Link Layer

- Abstraction: node-to-adjacent node
- General coverage (responsibilities, etc.)
- Implementation in NIC
- Multiple Access protocols
 - CSMA/CD, CSMA/CA, polling
- MAC addresses, broadcasting
- Framing
- Error detection/correction
- ARP
- Ethernet
 - Framing/byte stuffing

Topics: Physical Layer

- Router architecture
 - Input ports/queues, output ports/queues
 - Queuing delay/loss
 - Routing tables
 - Longest prefix match
- NIC, MAC address
- Transmission media
 - Wired, wireless
- Hubs, switches
- Network topologies
 - star, bus, ring

Topics: Wireless Networking

- Elements
 - Access point/wireless link/wireless host
- Models
 - Infrastructure, ad-hoc
- Issues, problems
 - Differences from wired networks
- 802.11 collision avoidance
 - RTS, CTS, etc.
- Mobility
 - Agents, handoffs
 - Care-of address
 - Direct/indirect routing
 - Overhead/performance

Topics: Network Security

- Aspects, concerns, threats, costs
- Security mechanisms
 - Perimeter security
 - Firewall, packet filtering
 - Encryption
 - Public key

End