

Date: Wednesday, May 13
10:05pm to 12:05pm
Location: MCB 307 (usual classroom)

Format:

The final exam will consist of 5-8 questions.

It will be **closed book, closed notes, closed computer/without wireless access**. However, you are **allowed to bring one letter-sized sheet of paper with prepared notes** (you may use front and back of that sheet.) In addition, you may bring the sheet you prepared for the midterm exam. You may also bring a copy of the two assigned research papers, as discussed below.

You are responsible for the content of lectures 1 through 25 (all lectures.) This includes, among others:

- General introduction to computer networks: service descriptions, protocols, reference models, circuit vs. packet switching, delay and loss in packet-switched networks, types of delay, models of layering, implementation techniques for layering, operating system issues.
- Application layer protocols: general principles and requirements, HTTP and DNS, XMPP, socket programming using UDP and TCP, server models.
- Transport layer protocols: multiplexing and demultiplexing, UDP, NAT, principles of reliable data transfer, stop-and-wait protocols, pipelined protocols (go-back-N and selective repeat), TCP and the principles employed in it.
- Congestion control: principles and approaches, network-based vs. end-to-end, congestion control in TCP
- Network layer: forwarding vs. routing, packet classification, router architectures and issues
- Principles of routing algorithms: link state routing, distance vector routing, hierarchical routing, intra- vs inter AS routing; broadcast routing protocols, multicast routing & ad-hoc routing.
- Internet network layer: IPv4 (including subnets & addressing), CIDR, IP fragmentation, ICMP, DHCP, RIP, OSPF, BGP, IPv6.
- Link layer services: principles of error detection & correction, checksums, CRCs, principles behind simple error-correcting codes. Mechanisms for media access control: channel partitioning, random access protocols, take-turn protocols. CSMA/CD. Link layer addressing and ARP.
- Link layer technologies: Ethernet. Technologies for interconnecting LANs: switches, 802.1d, VLANs.

The Kurose/Ross textbook covers this material in chapters 1 through 5.

Other resources to study for the exam include the Wireshark labs on the book's website as well as the self-assessment quizzes on the same site.

The final exam might also contain questions related to the additional required reading: the paper on the *Accountable Internet Protocol* and *Rethinking Packet Forwarding Hardware*. You may bring your copy of each paper for your reference.

The final exam may contain questions related to projects 1A/B and 2A/B.