

## Computer Science 4314 Computer Networking

### Student Learning Outcomes

1. Students will demonstrate an understanding of network architecture, both hardware and software.
2. Students will demonstrate an understanding of various network protocols.
3. Students will demonstrate an understanding of network communication protocols.
4. Students will write software to implement a client-server application using the socket programming API.
5. Students will demonstrate an understanding of public-private key encryption and how it can be used in an authentication scheme.
6. Students will demonstrate an understanding of the difference between IPv4 and IPv6 network protocols.
7. Students will demonstrate an understanding of quality of service.
8. Students will demonstrate an understanding of one or more routing algorithms.

### Course Content

**Textbook:** Computer Organization & Architecture: Designing for Performance, Seventh Edition, by William Stallings. The following chapters are covered (See textbook "Contents").

1. **Computer Networks and the Internet.** History and current architecture of the Internet, client-server model, packet switching, ISPs, throughput, packet loss, protocol layers, messages, segments, datagrams, frames.
2. **Application Layer.** Network application architectures, methods of process communication, transport services available to applications, application-layer protocols, World-Wide Web, HTTP, non-persistent and persistent connections, cookies, web caching, FTP, SMTP and email, DNS services, peer-to-peer applications, socket programming with TCP/UDP.
3. **Transport Layer.** Relationship between transport and network layers, multiplexing and demultiplexing, UDP transport, principles of reliable data transfer, TCP transport, congestion control.
4. **Network Layer.** Forwarding and routing, network service models, virtual-circuit networks, datagram networks, routers, switching, IP protocol, IPv4, IPv6, ICMP protocol, routing algorithms, routing in the Internet, broadcast and multicast routing.
5. **Link Layer and Local Area Networks.** Link layer implementation, error detection and correction, multiple access protocols, link-layer addressing, Ethernet, link-layer switches.
6. **Wireless and Mobile Networks.** Network characteristics, CDMA, 802.11 architecture and protocol, cellular internet access, routing.
7. **Multimedia Networking.** Audio and video compression, quality of service.
8. **Security.** Cryptography, public-private key encryption, message integrity, authentication.