CS 4390: NETWORK ARCHITECTURE AND APPLICATIONS

Semester Hours: 3.0
Coordinator: Sankardas Roy
Text: Computer Networking: A Top-Down Approach
Author(s): KUROS AND ROSS
Year: 2017, 7th edition

SPECIFIC COURSE INFORMATION

Catalog Description:

Layered architectures and protocols. TCP/IP protocol suite. Client-server communication paradigm. Application architectures such as push and pull technologies, web services, cloud and microservices, multimedia. Scalability and performance. Prerequisite: Grade of C or better in CS 3080.

Course type: REQUIRED

SPECIFIC COURSE GOALS

- 1. Justify the need for, and describe the working of, layered protocol suites, such as TCP/IP.
- 2. Develop client-server applications using TCP/IP
- 3. Assemble/disassemble packets and translate address as it traverses networks
- 5. Motivate the need for and summarize the details of service architectures, such as web services and micro-services
- 6. Describe the details, including payload types and synchronization of multimedia application protocols
- 7. Explain and distinguish the various service types supported by internet applications – for example, best effort, streaming
- 8. Construct the working of certain types of congestion control mechanisms.

STUDENT OUTCOMES ADDRESSED BY THIS COURSE
• B.1 Analyze a given problem, and identify and define the computing requirements appropriate to its solution.
• B.3 Apply mathematical foundations, algorithmic principles, and computer science theory as appropriate in modeling and solving real-world problems.
• B.8. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.

LIST OF TOPICS COVERED

  o Layered Protocol Architectures (~ 5%)
    ▪ TCP/IP and OSI
  o TCP/IP (~ 10%)
    ▪ LAN and other components
    ▪ Service view
    ▪ TCP vs UDP, and more
    ▪ Packet formats
  o Client-server Applications (~ 15%)
    ▪ Thread vs Process
    ▪ Sockets, RPC, etc
    ▪ Scalability
  o Transport and Routing (~ 15%)
    ▪ Reliable vs. unreliable transfer
    ▪ Congestion control
    ▪ Routing protocols
  o Service Architectures (~ 15%)
    ▪ Web services
    ▪ Microservices
    ▪ P2P and others
  o Multimedia (~ 10%)
    ▪ Real-time/streaming, VoIP
    ▪ Quality of Service
  o Wireless Communication (~ 10%)
- Wi-Fi
- Cell networks
  - Media and Performance (~ 10%)
    - Signal strength
    - Compression and error detection
    - Delay, loss, throughput
  - Emerging/Future Trends (~ 10%)
    - Parallel and distributed computing
    - Security
    - Others