Internet Protocols ECSE-6600

http://www.pde.rpi.edu/

Or

http://www.ecse.rpi.edu/Homepages/shivkuma/

Shivkumar Kalyanaraman

Rensselaer Polytechnic Institute

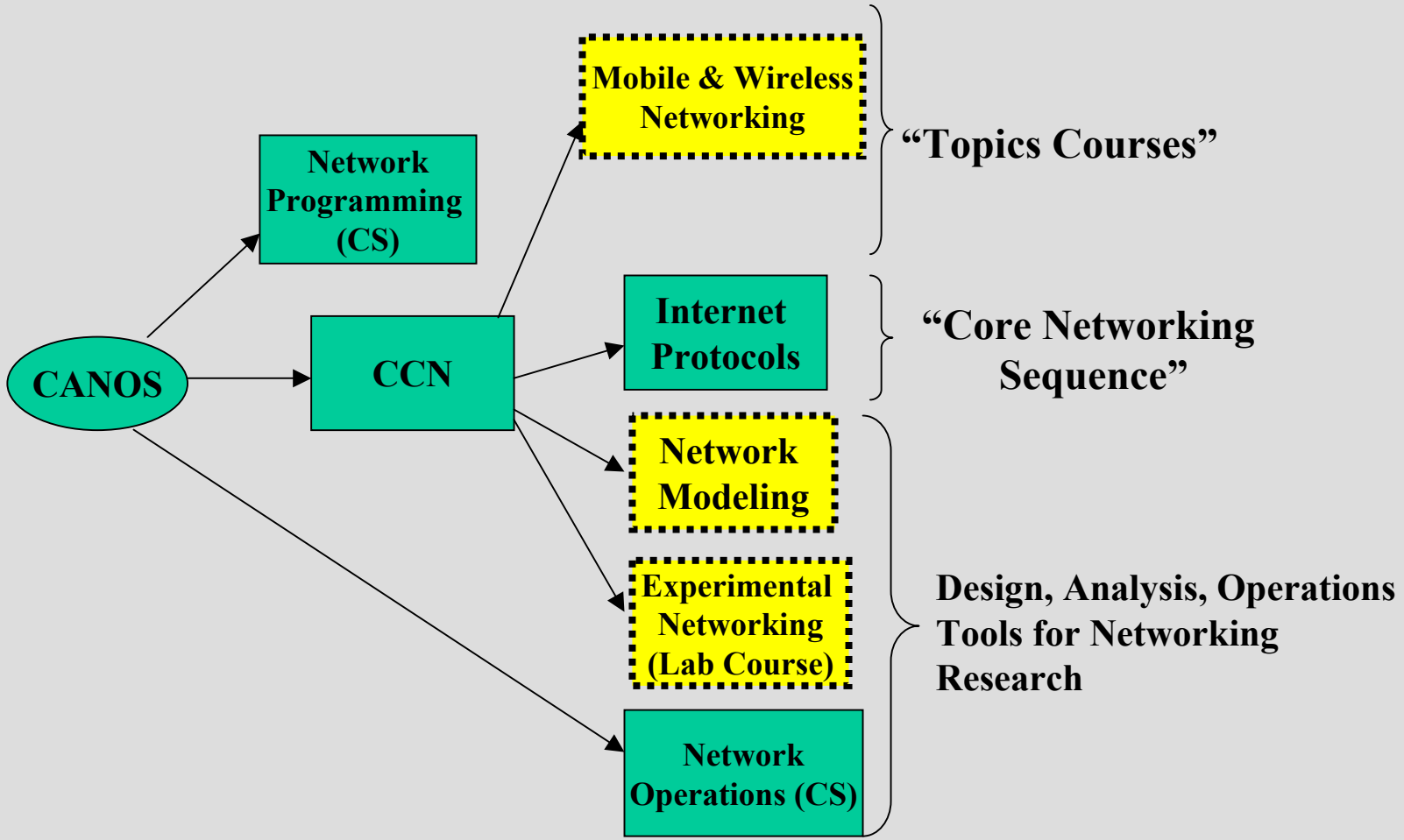
shivkuma@ecse.rpi.edu

- Introductions:course description & calendar
- Answers to frequently asked questions
- Prerequisites
- Informal Quiz

Who's Who

- **Instructor:** Shiv Kalyanaraman; kalyas@rpi.edu,
  - Room: JEC 6042, Phone: x8979
- **Course secretary:** (on-campus)
  - Jeanne Denue-Grady; denuej@rpi.edu,
  - Room: JEC 6049 ; Phone: x6313
- **PDE/RSVP Point-of-contact:**
  - Kari Lewick; lewick@rpi.edu, CII 4011; x2347
- **Production/Videostream Point-of-contact:**
  - Don Bazley: bazlyd@rpi.edu, x2421
- **WebCT Lectures Unavailable etc:**
  - Nadine Thompson, thompn@rpi.edu, x8501
- **TAs:**
  - Karthikeya Chandrayena
  - Satish Raghunath
  - Adnan El-Nasan

Networking Courses @RPI



Course Description Highlights

- Syllabus:
  - Core protocols: Transport (TCP, UDP), IP, Routing, Addressing/Naming ...
  - Advanced topics: Multicasting, Security, Next-generation IP, Better-than-best-effort Internet, High-Speed Routers, IP Telephony …
- Goals:
  - Breadth of topics
  - Depth in core areas, and key advanced topics
  - Insights into design and implementation
  - Preparation for possible research/advanced development in networking

Course Description Highlights (Continued)

- Lectures: problem-solution approach
- Informal quizzes: Every two weeks
- Remote students should download latest class material from WebCT for each class
- WebCT bulletin board: Post your questions!
- WebCT: Grades, papers, RFCs, Internet drafts…

- **2 Labs: Hands-on TCP and IP {20 pts}**
- **4 Homeworks: {20 pts}**
- **1 Research Case Study: {10 pts}**
- **3 exams: 15 pts, 15 pts, 20 pts: {50pts}**

Prerequisites

- Required ***(no exceptions):***
  - ESCE-4670 Computer Communication Networks or equivalent
  - VERY GOOD C programming knowledge
- Desirable:
  - Operating Systems
  - Computer Architecture (ECSE-4730 or equivalent)
- If you **do not have the required prerequisites**, you **must drop the course** and take it later (next year).

Prerequisites

- Protocol Layers: ISO/OSI reference model
- Physical Layer: Coding, Manchester
- Transmission Media: UTP, Cat 5
- Data Communication: Asynchronous vs synchronous, Baud, bit, and Hz, Half-Duplex vs Full-duplex, Modulation/Demodulation
- Packet Transmissions: Framing, Bit stuffing, byte stuffing
- Flow Control: On-Off, Window
- Error Detection: Parity, Checksum, Cyclic Redundancy Check

Prerequisites (Continued)

- Error Recovery: Start and Stop, Go back *n*, Selective Reject
- LANs: Aloha, CSMA/CD, Ethernet, IEEE 802.3, Token Ring/IEEE 802.5, FDDI
- Addressing: Unicast/multicast, Local/Global
- LAN wiring: 10Base5, 10Base2, 10Base-T, 100Base-TX,
- E-LANs: Hubs, Bridges, Routers, Switches
- Routing: Distance Vector vs Link State, Spanning tree, source routing
- Transport layer: multiplexing, reliability, congestion control, introduction to TCP and UDP
- Basics of probability and queuing theory

Still trying to get into the course ?

- Do you have the pre-requisites ?
- Please submit course add form to course secretary: Jeanne, JEC 6049 by tomorrow (Fri, Jan 18th), noon time (12 pm).
- Depending upon the number of people who drop the class, space available, TA resources available, we will add more students.
  - Decisions to be emailed to you by Jeanne.
  - Make sure you mention your email address to her.

Answers to FAQ's

- Lot of paper readings in the class (due every homework) + research case study (writing skills)
- Labs require advanced C programming skills
- Informal quizzes given periodically

- All homeworks/labs etc due at the beginning of the class indicated on the course calendar
  - Up to one late submission: no penalty
  - Beyond that 10% penalty: only if submitted before solutions are posted.

- All quizzes are open-book and extremely time limited.
  - Quizzes consist of design qns, numerical, multiple-choice (true-false), and short answer questions.

Informal Quiz: Prerequisites

T F (True or False)

- ☐ ☐ Datalink refers to the 3rd layer in the ISO/OSI reference model
- ☐ ☐ If peak rate = 10 Mbps, Avg rate = 2 Mbps and Service rate = 4 Mbps, multiplexing gain = 2.
- ☐ ☐ An even parity bit value for the 8-bit string 01101010 is 0.
- ☐ ☐ Packet forwarding is a control-plane function and routing is a data-plane function.
- ☐ ☐ Bridges and switches in Ethernet allow separation of collision domains, and reduce the degree of sharing of the physical media.
- ☐ ☐ Finding path from one node to another in a large network is a transport layer function.
- ☐ ☐ It is impossible to send 3000 bits/second through a wire which has a bandwidth of 1000 Hz.
- ☐ ☐ Randomness (in service and arrival) is what causes queuing at buffers.
- ☐ ☐ Little's law which relates expected queuing delay E(T) and expected # in the system E(n) is applicable only to M/M/1 queues.
- ☐ ☐ Little's law also holds for *instantaneous* (as opposed to average) queuing delay and instantaneous number in the system

Informal Quiz (Continued)

- ☐ ☐ Bit stuffing is used so that framing characters do not occur in the frame payload.
- ☐ ☐ CRC is based upon the idea that it is highly unlikely for an uncorrupted packet to be perfectly divisible by the CRC polynomial.
- ☐ ☐ Random access MAC protocols tend to perform very well at low loads in terms of channel multiplexing; but suffer from high delay at high loads.
- ☐ ☐ "Taking turns" or token-based protocols like token-ring offer a best of both partitioning and random access worlds.
- ☐ ☐ For long delay paths, on-off flow control is better than window flow control.
- ☐ ☐ Ethernet uses a CSMA/CD access method.
- ☐ ☐ The packets sent in a connection-oriented network are called datagrams.
- ☐ ☐ The distance-vector protocol involves checking neighbors' distance vectors and updating its own distance vector.
- ☐ ☐ Address structure is required to recognize whether the destination is one-hop or multiple-hops away.

Informal Quiz: Solutions

T F (True or False)

- ☐ √ Datalink refers to the 3rd layer in the ISO/OSI reference model
- ☐ √ If peak rate = 10 Mbps, Avg rate = 2 Mbps and Service rate = 4 Mbps, multiplexing gain = 2.
- ☐ √ An even parity bit value for the 8-bit string 01101010 is 0.
- ☐ √ Packet forwarding is a control-plane function and routing is a data-plane function.
- √ ☐ Bridges and switches in Ethernet allow separation of collision domains, and reduce the degree of sharing of the physical media.
- ☐ √ Finding path from one node to another in a large network is a transport layer function.
- ☐ √ It is impossible to send 3000 bits/second through a wire which has a bandwidth of 1000 Hz.
- √ ☐ Randomness (in service and arrival) is what causes queuing at buffers.
- ☐ √ Little's law which relates expected queuing delay E(T) and expected # in the system E(n) is applicable only to M/M/1 queues.
- ☐ √ Little's law also holds for *instantaneous* (as opposed to average) queuing delay and instantaneous number in the system

Informal Quiz Solutions…

√ ☐ Bit stuffing is used so that framing characters do not occur in the frame payload.

√ ☐ CRC is based upon the idea that it is highly unlikely for an uncorrupted packet to be perfectly divisible by the CRC polynomial.

√ ☐ Random access MAC protocols tend to perform very well at low loads in terms of channel multiplexing; but suffer from high delay at high loads.

√ ☐ "Taking turns" or token-based protocols like token-ring offer a best of both partitioning and random access worlds.

☐ √ For long delay paths, on-off flow control is better than window flow control.

√ ☐ Ethernet uses a CSMA/CD access method.

☐ √ The packets sent in a connection-oriented network are called datagrams.

√ ☐ The distance-vector protocol involves checking neighbors' distance vectors and updating its own distance vector.

√ ☐ Address structure is required to recognize whether the destination is one-hop or multiple-hops away.