Internet Protocols
ECSE-6600

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

GOOGLE: “Shiv RPI”

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Shivkumar Kalyanaraman
Introductions: course description & calendar

Answers to frequently asked questions

Prerequisites

Informal Quizzes
Who’s Who

- **Instructor:** Shiv Kalyanaraman; kalyas@rpi.edu,
  - Room: JEC 6042, Phone: x8979
- **TA:**
  - TBD
  - (check WebCT announcements)
Networking Courses @RPI

- Network Programming (CS)
- Mobile & Wireless Networking
- Network Security (CS)
- Internet Protocols
- Network Modeling
- Experimental Networking (Lab Course)
- Network Operations (CS)

“Topics Courses”

“Core Networking Sequence”

Design, Analysis, Operations Tools for Networking Research

Rensselaer Polytechnic Institute

Shivkumar Kalyanaraman
Course Description: Goals

- Fundamental protocol concepts in the context of concrete/real protocols (including protocols that did not survive)
  - As if YOU designed the protocols grappling through the tradeoffs…
  - *Where* do these ideas really come from?
  - Identify common themes, building blocks…
    - Look beyond alphabet soups, idiosyncratic differences and stove-pipes!
  - Broad foundation of advanced material of *lasting value*: you can draw upon them in future (even in related fields)!
- Insights into design and implementation: lab exercises
- Preparation for possible research/advanced development in networking (reading of *papers*, fundamental perspective, *case-study*)
- In-class work (*informal quizzes*) & discussion (be prepared!)
Syllabus

- **Core problems**: heterogeneity, scale, coordination of distributed components, handling failures, sharing resources, managing congestion

- **Building Blocks**: workload units (call vs packet), multiplexing, indirection, virtualization, identifiers/name-space structures/scopes, signaling/state management, randomization, distributed coordination and control, redundancy

- **Core protocols**: Transport (TCP, UDP), IP, Routing, Addressing/Naming.

- **Advanced topics**: Multicasting, Peer-to-Peer, Next-generation IP, Better-than-best-effort Internet (QoS), High-Speed Routers, IP Telephony, Security … (may not cover all)
Course Description Highlights

- Lectures
- Informal quizzes: Every week (every 2 classes)
- Be prepared: I will randomly call on students to explain ideas.
- Remote students: download latest class material from WebCT or class web page for each class
- WebCT bulletin board: Post your questions! TA will monitor regularly.
- WebCT: Grades, papers, RFCs, Internet drafts…

- Grading:
  - Informal Quizzes & Paper Summaries: {10 pts}
  - 2 Labs: Hands-on TCP and IP {20 pts}
  - 1 Research Case Study: {20 pts}
  - 3 exams: 15 pts, 15 pts, 20 pts: {50 pts}

- Quiz dates: **Feb 23rd, Mar 30th, May 1st.**
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 me by tomorrow noon
- 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.
  - Make sure you mention your email address
Answers to FAQ's

- Considerable paper readings in the class + research case study (writing skills)
- Labs require advanced C programming skills
- Informal quizzes given every week

- 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.