Course Logistics
Welcome to ECE/CS 438

- **Timing:** M/W 3:30 – 4:50pm, UIUC time
- **Mode:** Online (Zoom) → 220 students
- **Course URL:** [https://courses.grainger.illinois.edu/cs438/fa2021/](https://courses.grainger.illinois.edu/cs438/fa2021/)

- **Instructor:** Romit Roy Choudhury
  
  Faculty ECE and CS
  PhD from UIUC, 2006
  Research: Wireless/Mobile Networking, Sensing
  Webpage: croy.web engr.illinois.edu

- **Office Hours:** M/W after class
  Or email [croy@illinois.edu](mailto:croy@illinois.edu) for 1:1
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- Teaching Assistants (TAs) ... see website for email IDs

Ishani

Kaiwen

Wally

Hyungjoo
Welcome to ECE/CS 438

- Prerequisite:  - Probability
  - Programming

- Further courses:
  - Advanced Computer Networks
  - Advanced Wireless Networking
  - Hot Topics in Mobile Computing
  - Advanced Distributed Systems
  - IoT, Big Data, and CyberPhysical Systems
  - …
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- **Information Dissemination:**
  
  URL: [https://courses.grainger.illinois.edu/cs438/fa2021/](https://courses.grainger.illinois.edu/cs438/fa2021/)
  
  Most course related information will be posted on the website
  
  When in doubt, check the webpage.

- **Some reminder/clarification emails may be sent out**

- **Piazza:**
  
  - Just search for “ECE CS 438” on Piazza.
  
  - Piazza meant entirely for students to communicate.
  
  - Faculty and TAs may respond occasionally.
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**Grading:**

- Homework (4): 15%
- Programming Assignments (3 or 4): 25%
- 1 mid-term exam: 25%
- Final exam: 35%

- Programming assignments may be in groups of 2. Each group makes single submission.

- 4 credit students need to complete a mini-project and submit a report at the end of semester (more later)
Finally

- Academic honesty

1. I believe you won’t cheat. If you are anxious, or in great pressure … talk to me. I understand, and some accommodations can be made. But don’t take the “wrong pill”.

![Matrix with red and blue pills](image)
Academic honesty

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• In the long run, GPA does not matter as much as you think it does. Tarnishing a long-term career not worth the 0.05 net GPA points.

• I am lenient and easy-going until someone is proven to be cheating.
Course Summary
(Very Briefly)
Course information

Course materials:

Text:

Class notes/slides
Acknowledgment to Jim Kurose

Some supplementary reading material
What is this course about?

- *Introductory* (first) course in computer networking
- Undergrads, early grad students

- Learn principles of computer networking
- Learn practice of computer networking
- Internet architecture/protocols as case study
- Real wireless networks as case studies
- Glimpses into the future of networking
Course information

- By the time you are finished …
  - You understand variety of factoids and concepts
- Propagation delay, transmit time, queueing, …
- Internet layered architecture, HTTP, DNS, P2P, …
- Sockets, Ports, …
- Congestion Control, Flow Control, TCP, …
- Routing, Basic Graphs, Djikstra’s Algorithm, IP, BGP, OSPF,…
- DSL Vs Cable, Aloha, CSMA, TDMA, Token, …
- Cellular Network architecture, handoff, roaming, Mobile IP, …
- Wireless Networks (WiFi)
- Security, RSA, Digital certificates, MIM attacks, …
- …

If you understand 75% of these terms, you shouldn’t be here
What this Course Does Not Cover

- Does not cover
  - Device drivers, SDNs, cloud computing …
  - Network theory, graph theory, proofs
  - Radio hardware, embedded systems, IoT, scheduling
  - Modulation schemes, transmitter/receiver design
- Not a “communications” course

This is course on
- Understanding, analyzing, and (perhaps) designing protocols and algorithms in networking systems (with case studies in wired and wireless networks)
What’s the difference between Communications and Networking?

Communications
- What you send (pkts)
- Thru networks

Networking
- Roads between src & destination
- Protocols/algos

Hardware
Finally

- I cannot / will not / should not be speaking alone in class
  - Questions
  - Comments
  - Disagreements
  - Debates … are highly encouraged

- This course can be real fun

- Whether it will be …
  - Is up to you and me
Hello!
I am ECE/CS 438
Computer Network Architecture

Past, Present, and Future
On the Shoulders of Giants

- 1961: Leonard Kleinrock published a work on packet switching
- 1962: J. Licklider described a worldwide network of computers called Galactic Network
- 1965: Larry Roberts designed the ARPANET that communicated over long distance links
- 1971: Ray Tomilson invents email at BBN
- 1972: Bob Kahn and Vint Cerf invented TCP for reliable packet transport
On the Shoulders of Giants …

- 1973: David Clark, Bob Metcalfe implemented TCP and designed ethernet at Xerox PARC

- 1975: Paul Mockapetris developed DNS system for host lookup

- 1980: Radia Perlman invented spanning tree algorithm for bridging separate networks

- Things snowballed from there on …
What we have today is beyond any of the inventors’ imagination …
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And YOU are here

And by “YOU” I mean …

“Cool” internet appliances
- Web-enabled toaster + weather forecaster
- World’s smallest web server
- IP picture frame
- Internet phones
- WiFi light bulbs

And Of Course people …

InterNetwork
- Millions of end points (you, me, and toasters) are connected over a network
- Many end points can be addressed by numbers
- Many others lie behind a virtual end point
- Many networks form a bigger network
- The overall structure called the Internet

Internet structure: network of networks
- Roughly hierarchical
- At center: “tier-1” ISPs (e.g., MCI, Sprint, AT&T, Cable and Wireless), national/international coverage
- Treat each other as equals

Tier-1 ISP: e.g., Sprint
- Sprint US backbone network
- Cities and towns
- POP: point-of-presence
- DS3 (45 Mbps)
- OC3 (155 Mbps)
- OC12 (622 Mbps)
- OC48 (2.4 Gbps)
- … to/from customers peer-to-peer

Cables Laid Out in the Oceans
- Cable Connections carry 95% traffic (rest?)

Tier-2 ISPs: smaller (often regional) ISPs
- Connect to one or more tier-1 ISPs, possibly other tier-2 ISPs
- France telecome, Tiscali, etc. buys from Sprint
- Tier-2 ISPs also peer privately with each other, interconnect at NAP

Tier-3 ISPs and local ISPs (Time Warner, Earthlink, etc.)
- Last hop (“access”) network (closest to end systems)
- Local and tier-3 ISPs are customers of higher tier ISPs connecting them to rest of Internet

Internet diagram