CS425: Computer Networks

1. **Objectives:** This course is an introduction to computer networks. The goal is to provide the students a general overview of the communication technologies over the networks. We will discuss the layered protocol stack of the modern computer networks and how our messages are sent across this network for various activities we do on the Internet. This is aimed to be a mix of theoretical and hands-on study of the computer networks.

2. **Pre-requisites:** Some familiarity with formal mathematical reasoning, e.g., probability theory, basics of computational complexity, and familiarity with computer programming.

3. **Course Syllabus:**

   A tentative list of topics are as follows.

1. Introduction, history and development of computer networks, networks topologies. Layering and protocols.
2. Physical Layer: Different types of transmission media, errors in transmission: attenuation, noise. Repeaters. Encoding (NRZ, NRZI, Manchester, 4B/5B, etc.).
3. MAC Layer: Aloha, CSMA, CSMA/CD, CSMA/CA protocols. Examples: Ethernet, including Gigabit Ethernet and WiFi (802.11). Time permitting, a quick exposure to Token Ring and to Bluetooth, WiMax may also be included.
4. Data Link Layer: Error detection (Parity, CRC), Sliding Window, Stop and Wait protocols.
5. LAN: Design, specifications of popular technologies, switching. A student should be able to design LAN of a campus or a building.
6. Network layer: Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Subnetting, Classless addressing, Network Address Translation.
7. Transport layer: UDP, TCP. Connection establishment and termination, sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions, etc.
8. Design issues in protocols at different layers.
9. Network Programming: Socket Programming.
10. Session, Presentation, and Application Layers. Examples: DNS, SMTP, IMAP, HTTP, etc.
11. Network Security: Concepts of symmetric and asymmetric key cryptography. Sharing of symmetric keys - Diffie Hellman. Public Key Infrastructure. Public Key Authentication Protocols. Symmetric Key Authentication Protocols. Pretty Good Privacy (PGP), IPSec, Firewalls.

4. **Evaluation Components & Policies:** One midterm and one endterm exam (weightage 25% each), four assignments (weightage 10% each) to be submitted individually. Scribed lecture notes should be submitted within 2 days of every lecture, this weighs 10% of the course weight. Scribing can be done in a group – so send me one email per group when you identify your group of **four** students.

5. **Lecture schedule & venue:** Tuesday, Friday 14.00-15.15 hrs, RM 101.

   Three make-up classes on **Feb 26, Mar 4, and Mar 18** respectively at **18.30-20.00 hrs (in KD101)**. These classes replace the classes of the correspondingly following Fridays.

6. **Course webpage:** https://swaprava.wordpress.com/cs425
7. **Piazza**: http://piazza.com/iitk.ac.in/secondsemester2020/cs425/home
8. **Gradescope**: https://www.gradescope.com/courses/77811
9. **Teacher**: Swaprava Nath. **Office hours:** via email: swaprava@cse.iitk.ac.in with subject including [CS425]
10. **Teaching assistants:**
    1. Gufran Siddiqui, gufran@cse.iitk.ac.in
    2. Kranti Kumar Parida, kranti@cse.iitk.ac.in
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    5. Sristi Jaiswal, sristij@cse.iitk.ac.in
    6. Nilesh Uddhav Kothavade, nileshk@cse.iitk.ac.in

    For confusions/doubts, it is better to post on Piazza before reaching out to the TAs (information available on course homepage).
11. **Scribing:**

    See the webpage for the template of scribing the lectures. You may use the IPE tool for drawing figures. Please email the instructor the scribed lecture notes within **two** days of the class (first week scribes get one week's time) – I'll immediately put them on the course page as 'draft'. Later when I review the notes, you may need to update the notes and resubmit. *Less the update needed, better is the credit – so consider to do the first draft carefully.*

    The scribing will be in a **group of 4 students**. Please send your group information by **Sunday, Jan 5, 11:59 PM**. Only **one email from the group** mentioning the names of the group members should be sent to me (swaprava@cse.iitk.ac.in) with cc to garima@cse.iitk.ac.in and sristij@cse.iitk.ac.in.
12. **Books & References:**
    1. AS Tanenbaum, DJ Wetherall, Computer Networks, 5th Ed., Prentice-Hall, 2010.
    2. JF Kurose, KW Ross, Computer Networking: A Top-Down Approach, 5th Ed., Addison-Wesley, 2009.