CS425: Computer Networks

1. **Objectives:** This course is an introduction to computer networks. The goal is to provide the students with 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.

4. **Evaluation Components & Policies:** (tentative – the evaluation methods may change based on the technology made available by the institute) One midterm and one endterm exam (25% weight each), two programming assignments (15% each – group activity), two quizzes (10% each). Programming can be done in C, C++, or Python. No other languages are allowed. Please form groups of size at most 5 (five) and inform before Jan 27, 2021, 2PM. Programming assignment is the only group activity. Please register your group here (only ONE person from your group should enter this information): https://forms.gle/SZ82NoHDusSfwf1R7.

5. **Lecture schedule & venue:** We will have the recorded lectures and weekly discussion mode. The weekly lecture videos will be released and the weekly discussions will be on Wednesdays from 14.00-15.15 hrs, on zoom.
   Join Zoom Meeting

https://zoom.us/j/99076910116?pwd=RC82Mzl2T0toZGJVaElSSzdUQUI0dz09

Meeting ID: 990 7691 0116
Passcode: 152967

6. **Course webpage:** https://swaprava.wordpress.com/cs425-2021

7. **Mookit Forum:** https://hello.iitk.ac.in/manage/cs425a2021/forums

8. **Piazza (backup option, will be used only if the above option does not work):** https://piazza.com/iitk.ac.in/secondsemester2021/cs425

9. **Teacher**: Swaprava Nath. **Office hours:** via email: swaprava@cse.iitk.ac.in with subject including [CS425]

10. **Teaching assistants:**

    1. Garima Shakya – garima@cse.iitk.ac.in

    2. Gufran Siddiqui – gufran@cse.iitk.ac.in

    3. Anurag Maithani – amanurag@cse.iitk.ac.in

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    5. Putrevu Mohan Anand – pmohan@cse.iitk.ac.in

    For confusions/doubts, it is better to post on forum before reaching out to the TAs (information available on course homepage).

11. **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.