

# CS 740: Advanced Computer Networks (Spring 2008)

Instructor: Aditya Akella

<http://www.cs.wisc.edu/~akella/CS740/S08> (under constr.)

This course will provide a broad overview of Computer Networking research. In general, we will look at three aspects of the research in various networking topics:

1. *The Classical Past*: We will survey a handful of “classical” research ideas and approaches. Some of these have stood the test of time. Others are widely revered even today, yet they are seldom used. We will try to understand why this is the case for each approach/idea.
2. *The Cutting-Edge Present*: We will explore the state of the art in select networking technologies, protocols and algorithms. We will investigate the driving forces behind these, and their sustainability in the future.
3. *The Fictional Future*: We will overview some emerging ideas on how to reshape the Internet to gear up for the unforeseen future. We will investigate if, and why, such ideas may be necessary, and how they might materialize.

The goal of this course is not only to keep students abreast with current networking research, but also to encourage them to think “clean-slate”: *Given the benefit of hind-sight, if we were to redesign the Internet from scratch, how would we do it?*

## **Key Course Details:**

The course will be largely paper-reading based. We will discuss papers that cover the past, present and the future of the following topics:

1. Internet architecture
2. Internet Routing including MPLS, Traffic Engineering
3. Transport mechanisms and queue management
4. Naming, service and resource discovery
5. Quality-of-Service and economics
6. Security, end-host, application and network-level
7. Wireless, Emerging wireless access methods (Mesh networks, MIMO)
8. Peer-to-Peer systems and other emerging applications (e.g. social networking)
9. Network Management and troubleshooting
10. Measurement and monitoring

Students will be assigned readings on these topics prior to each class. Students are expected to submit 2-3 paragraph critiques of the assigned papers.

In addition, students in the class will be expected to do a research project. The projects are to be done in groups of two. Early in the semester, a number of possible projects will be discussed in class. Some of these projects will be empirical and will be aimed at having students measure and understand key issues facing networking, such as Spamming

activity and spammer behavior, routing performance and reachability, performance of VoIP networks, malware propagation, wireless network performance and impact of transmit power control etc. Others will be more exploratory and delve into specific topics such as securing wide-area networks, new management techniques for networks, designing all-wireless last-hop access etc.

Students are encouraged to define their own projects too. *Students are especially encouraged to explore disruptive, non-incremental ideas*; but, they must be able to convince the instructor, and the class, that the problem is important and the ideas are practical.

Each group of students must submit a written project plan by the 3<sup>rd</sup> week of classes, provide a short oral mid-semester update, and submit a final project report at the end of the semester. Each group is also expected to make a final oral presentation on their project to the entire class.

### **Other Course Details**

*Course Prerequisites:* The pre-requisite for this course is CS 640, the undergraduate-level course in Computer Networks, or an equivalent under-graduate course. Students who do not meet these pre-requisites must obtain special permission from the instructor.

*Text Books and Readings:* There is no required text for this course. The entire paper reading list will be available at: <http://www.cs.wisc.edu/~akella/CS740/S08/papers.html> (under construction)

*Grading:* The course project carries 45% of the grade. The paper summaries are worth 10%. The course will have two in-class exams, carrying 40% of the grade. Class participation will count for 5%.

### **General Information**

Class Time: Monday, Wednesday, Friday 9.30-10.45am (twice a week on average)

Location: TBA

Instructor: **Aditya Akella.**

Email: [akella@cs.wisc.edu](mailto:akella@cs.wisc.edu).

Office: CS 7379.

Office Hours: 11am-Noon after class, on each class day.

Teaching Assistant: TBA.

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Office: TBA.

Office Hours: TBA.