

# CS5229

## Advanced Computer Networks

Ooi Wei Tsang

ooiwt@comp.nus.edu.sg

AS6, 05-14

# Fundamental principles/techniques of computer networking

Through reading  
classic/influential  
papers

# Philosophy

Students are expected to be: Mature,  
Independent, Resourceful

What you learned is more important  
than your grade.

# **Please don't ask..**

“Should I memory this equation?”

“Do I have to memorize this header format?”

“Post model answer to X”

# **Academic Honesty**

No copying among students

No copying from published work

**ZERO tolerance to plagiarism.**

# Please do ask ..

“What is the effect of changing  $k$  in the equation?”

“Why did the designer added this bit in the header?”



# Discussion?

Strongly encouraged (when permitted)

But ..

must acknowledge all contributions

write up solution independently

# **Continuous Assessment**

35% Final exam (open book)

40% Two programming assignments

25% Midterm (open book)

# Other Related Courses

**CS4222:** Wireless Computing and Sensor Networks

**CS4274:** Mobile and Multimedia Networking

**CS532 I:** Network Security and Management

**CS6204:** Advanced Topics in Networking

**MA625 I:** Modeling for Computer Network  
Performance

**EE59 I 3, 6302, 640 I, 6902 etc.**

**You won't see much..**

wireless networks  
sensor networks  
mobile networks  
network security

# **Reading Materials**

No textbook for this class. Materials comes from research papers online.



- Module
- Description**
- Text & References
- Class Roster
- Guest Roster
- Class Groups
- Timetable
- Announcement
- Assessment
- Discussion Forum

Module Code	CS5229		
Module Title	ADVANCED COMPUTER NETWORKS		
Semester	Semester 1, 2007/2008		
Modular Credits	4		
Faculty	School of Computing		
Department	Computer Science		
Teaching Staff	DR OOI WEI TSANG	dcsooiwt@nus.edu.sg	Lecturer
Weblinks	<a href="http://www.comp.nus.edu.sg/~ooiwt/cs5229">http://www.comp.nus.edu.sg/~ooiwt/cs5229</a> The MAIN course website	Teaching Website	☆☆☆☆
Module Blog	--		

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**AIMS & OBJECTIVES**

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This course covers advanced fundamental principles of computer networks and techniques for networking. The goal of this course is to teach these fundamentals/techniques that will remain important and relevant regardless of the hot topics in networks and networking. Briefly, the topics include advanced network architecture and design principles, protocol mechanisms, implementation principles and software engineering practices, network algorithmic, network simulation techniques and tools, performance analysis and measurement, and protocol specification/verification techniques.

**PREREQUISITES**

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CS2105 or equivalent introductory computer networking modules.

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# CS5229 : ADVANCED COMPUTER NETWORKS

SEMESTER 1, 2007/08

About  
Calendar  
Reading List  
Assignments

## LECTURE 1: DESIGN PRINCIPLES OF THE INTERNET

- D. D. Clark. "The Design Philosophy of the DARPA Internet Protocols," in the Proceedings of ACM SIGCOMM '88, August, 1988. CiteSeer
- J. H. Saltzer, D. P. Reed, and D. D. Clark. "End-to-end arguments in system design," ACM Transactions on Computer Systems, pages 277--288, 1984. CiteSeer

## ABOUT CS5229

- **Who:** Ooi Wei Tsang (ooiwt)
- **Where:** Building COM1, Room 204
- **When:** Fri 1830-2030
- **Workload:** Lecture (2hr) Preparation (6hr) Homework (2hr) per week
- **CA:** Open Book Exam (35%) Assignments (40%) Quizzes/Midterm (25%)
- **Objective:** This course covers advanced fundamental principles of computer networks and techniques for networking. The goal of this course is to teach these fundamentals/techniques that will remain important and relevant regardless of the hot topics in networks and networking. Briefly, the topics include advanced network architecture and design principles, protocol mechanisms, implementation principles and software engineering practices, network algorithmic, network simulation techniques and tools, performance analysis and measurement, and protocol specification/verification techniques.

## TENTATIVE SYLLABUS

- Design principles (End-to-End Arguments, Layering)

# **Assumed Background**

Undergraduate-level Networking

(CS2105/CS3103 or equivalent)



# **Internet Architecture**

You know what the following terms mean: router, switches, ISP, AS.

You know how Internet is different from a Telephony network.

# **Internet Architecture**

You frown when someone equates  
the Internet with the Web

# **Naming/Addressing**

You know what is a domain name, what is an IP address, and how to map between the two.

You know how DHCP assigns a dynamic IP address to you host.

# **Protocol Layers**

You know the functionalities of 5 layers of the Internet protocol stack.

# **Application Protocol**

You roughly know how HTTP and  
FTP works.

# Transport Protocol

You know what is a port and socket

You can tell the differences between TCP and UDP. You know in what situation you should use which.

# TCP

You know why congestion control and flow control are needed. You roughly know how TCP's congestion control works.

# **Network Layer**

You know that almost everything runs on IP. You know how packets are routed on the Internet, at least within an AS.



# **Network Layer**

You know what's a private IP address and why NAT makes P2P file sharing difficult.

# Ethernet

You know why Ethernet is a random access protocol. You know what collision and backoff mean in this context.

# Ethernet

When people talked about “MAC address” you didn’t think it’s related to location of nearest McDonald.

You know how mapping between MAC and IP addresses is done.

# **Tools**

You have used ping or traceroute.  
Or at least heard about them and  
know what they are for.

# **Basic Probability**

You know what is expected value, variance, random variable, and cumulative distribution function.

You know how to compute conditional probability and probability of two events.

# **Programming**

You know how to program in C or C++, and is comfortable in picking up new languages.