

King Fahd University of Petroleum & Minerals
College of Computer Sciences and Engineering

ICS 343: Fundamentals of Computer Networks (3-3-4)

Spring Semester 2007-2008 (071)

Syllabus

Coordinator & Instructor: Dr. EL-SAYED EL-ALFY

Office Location: 22-108, **Phone:** 860-1930, **E-mail:** alfy@kfupm.edu.sa

Schedule

Sec #	Lectures		Labs	
	01	02	51	52
Time	SMW 10:00am- 10:50am	SMW 1:10pm-2:00pm	M 2:10-5:10pm	T 2:10-5:10pm
Venue	24-178	24-178	23-016	23-016
Instructor	Dr. El-Alfy	Dr. Darwish	Mr. Saleem	Mr. Ghandi
Office Hours	SMW 9:00-10:00am ⁺	TBA	TBA	TBA

⁺also available by appointment

Catalog Description

This course provides a comprehensive and current introduction to computer networks with focus on the functions performed at each layer of the network architecture and common layer protocol standards. Topics covered include: Introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching, TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP, WWW, socket programming and network security; Transport layer: TCP and UDP, congestion control; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical layer: principles of data communications, circuit switching, coding, multiplexing and transmission media. **Pre-requisite:** ICS201. **Note:** This course cannot be taken for credit with COE 344

Objectives

- Develop a solid conceptual understanding of the essentials and design issues underlying a wide spectrum of modern computer network technologies with focus on the Internet model.
- Provide students with an opportunity to gain practical insights and hands-on experience on using networking hardware, software and tools.

Learning Outcomes

Upon completion of the course, you should be able to:

- CO1. Identify various network services, characteristics, elements, standards and technologies.
- CO2. Describe the layered architecture of computer networks and the operation of main protocols in the TCP/IP model.
- CO3. Identify, compare and contrast different techniques and design issues of core functions such as addressing, routing, internetworking, switching, multiplexing, error and flow control, medium access and coding.
- CO4. Implement simple client-server applications using socket programming.
- CO5. Effectively use commonly used network-related commands, monitoring tools, traffic analyzers and network simulators.
- CO6. Demonstrate the ability to setup a small network and properly configure network components including switches, routers and services (such as RAS, FTP, DNS, Web, DHCP, POP3).
- CO7. Explain potential threats to network resources and various security mechanisms.

Required Material

- [Data Communications and Networking](#), 4/e. Behrouz A Forouzan, McGraw-Hill Higher Education 2007, ISBN-13: 978-007-125442-7. <http://www.mhhe.com/forouzan>
- Lab Manual. Available through WebCT.

Recommended References

- Computer Networking: A Top Down Approach Featuring the Internet, 3/e, J. Kurose & Keith Ross, Addison Wesley, 2005
- Computer Networks and Internets, 4/e, Douglas Comer, Prentice-Hall, 2004
- Computer Networks: A Systems Approach, 3/e, Larry L. Peterson, Bruce S. Davie, Morgan Kaufmann Publishers, 2003

Networking Laboratory

The lab involves several projects to gain hands-on experience with network devices, programming and tools. More specifically, it provides you with the opportunity to:

- Setup various servers such as DNS, DHCP, Web Servers on different platforms
- Develop simple client/server network applications using sockets
- Create simple web pages
- Simulate a network
- Analyze various protocols by capturing packets
- Measure network utilization under varied situations
- Use various network-related commands
- Configure switches and routers.

Grading Policy

	Approx. amount	Grade Distribution
Homework Assignments [Practice]	bi-weekly	0%
Course Portfolio + Participation	-	5% (Bonus)
Quizzes (Week#: 4, 8, 14)	3	10%
Major Exam # 1 (Week#6: Wed. Oct. 31 @5:00-7:00pm)	-	20%
Major Exam # 2 (Week#11: Wed. Dec. 5 @5:00-7:00pm)	-	20%
Comprehensive Final Exam (TBA)	-	25%
Lab (3Quizzes: 12% + Final: 10% + Att. & Reports: 3%)	-	25%

Tentative Outline

Topics		Readings**
Generic (~4 lectures)	<ul style="list-style-type: none"> • Class admin & overview • Introduction to computer networks • Layered architectures: ISO and Internet models. 	Ch.1, Ch.2
Application Layer (~11 lectures)	<ul style="list-style-type: none"> • Application layer overview & C/S Model 	Handout
	<ul style="list-style-type: none"> • DNS, SMTP, FTP, Telnet 	Ch. 25, 26
	<ul style="list-style-type: none"> • WWW & HTTP 	Ch. 27
Physical Layer (~4 lectures)	<ul style="list-style-type: none"> • Socket programming using TCP and UDP • Building a simple web server 	Handout
	<ul style="list-style-type: none"> • Data communication basics • Coding and Multiplexing • Transmission media • Switching 	Selected topics of Part 2: Ch. 3, 4, 6, 7, 8, 9
Data Link Layer	<ul style="list-style-type: none"> • Data link layer overview • Flow and error control • Internet data link control protocols: PPP and HDLC 	Ch. 10, 11

(~8 lectures)	<ul style="list-style-type: none"> • Medium access control • Local area networks • Wireless LANs (brief) 	Selected topics of Ch. 12, 13, 14
	<ul style="list-style-type: none"> • Bridges and VLANs 	Ch. 15
Network Layer (~9 lectures)	<ul style="list-style-type: none"> • <u>Internetworking, Addressing and Routing</u> 	Ch. 19
	<ul style="list-style-type: none"> • Network layer protocols 	Ch. 20, 21
	<ul style="list-style-type: none"> • Unicast and multicast routing 	Ch. 22
Transport Layer (~6 lectures)	<ul style="list-style-type: none"> • Overview & process to process delivery • TCP and UDP 	Ch. 23
	<ul style="list-style-type: none"> • Congestion control • Quality of service 	Ch. 24
Security (~3 lectures)	<ul style="list-style-type: none"> • principles of network security and cryptography • Message security and user authentication • Firewalls and VPNs 	Selected topics of Part 7: Ch. 30, 31, 32

**Note: Chapter numbers may differ based on the textbook edition

Rationale (Why should I take this course?)

*According to the computing curriculum developed by ABET: “The rapid evolution of the discipline has a profound effect on computer science education, affecting both content and pedagogy. Today, **networking and the web have become the underpinning for much of our economy. They have become critical foundations of computer science, and it is impossible to imagine that undergraduate programs would not devote significantly more time to this topic.** At the same time, the existence of the web has changed the nature of the educational process itself. Modern networking technology enhances everyone’s **ability to communicate** and gives people throughout the world **unprecedented access to information.**”*

Additional Notes

- Course material will be posted on the **WebCT**.
- Assignments must be submitted on the due date. **No** late or email submissions will be accepted.
- Lectures and labs are integrated and they complement each other.
- Attendance
 - Attendance will be checked at the beginning of each class.
 - Each 2 late attendances will be considered as one absence.
 - An official excuse must be shown within one week of return to classes.
 - 1% will be deducted for every two *unexcused* absences.
 - More than 9 *unexcused* absences will *automatically* result in a DN grade.
- No make-up of Labs, Quizzes, and Exams.
- Students are responsible for all announcements made by the instructor
- *Student participation & collaboration* are highly encouraged; recent studies have shown that the more student engagement in the learning process, the better they learn.
- Taking notes during the class is highly recommended
- **3-Day Policy:** One has **3 days** starting from the end of the class time in which the graded assignment/exam papers have been distributed and/or posted in order to object to the score of that assignment or exam.
- **ZERO-TOLERANCE for CHEATING, whether in exams, quizzes or PROGRAMMING ASSIGNMENTS.** Plagiarism, copying and other anti-intellectual behavior are prohibited by the university regulations. Violators will face serious consequences.
- All cell phones and pagers must be “on silent” mode during classes and “turned off” during exams.