1. Course Code

2201

2. Course Title

Fundamentals of Information Networks

3. Teacher

SHIMA, Hisato

4. Term

Fall 1

5. Course Requirements (Courses / Knowledge prerequisite for this course)

If you do not have basic knowledge of copmputer systems, it is recommended to take "2206 Foundations of Computer Systems" also.

6. Course Overview and Objectives

In this course, students learn concepts, schemes, features, structures and behaviors of information communication networks. Learn the protocols from the physical layer, the network layer, the transport layer, and the application layer, and understand how the Internet and network applications are working.

7. Course Outline

1 Overview of Information network
2 Layered Structure of Networks and Digital information
3 Connecting Devices: Network Interface Layer
4 Ethernet Switches and WLAN Access point
5 Network of Network : The Internet
6 Communication using IP packets
7 Delivering Packets to the world (Routing)
8 IPv6
9 ICMP and UDP（Transport Layer）
10 Reliable Communication: TCP(Transport Layer)
11 World Wide Web （Application Layer）
12 More on WWW and Electric Mail （Application Layer）
13 Student Presentation
14 Student Presentation
15 Summary of Information Networks
16

8. Textbooks (Required Books for this course)

None

9. Reference Books (optional books for further study)

Title: Computer Networking: A Top-Down Approach
Author: James F. Kurose, Keith W. Ross

10. Course Goals (Attainment Targets)

(1) Can explain the mechanism of the each layers of TCP / IP protocol.
(2) Can explain the functions of various network devices.
(3) Can explain the domain name and DNS, HTTP and web server mechanism
(4) Can research and present network technology by group.
(5)
(6)
(7)
(8)

11. Correspondence relationship between Educational goals and Course goals

Educational goals of the school			Course Goals
High level ICT skills	Basic academic skills		(1)(2)(3)
	Specialized knowledge and literacy		
Human skill (Tankyu skill)	Ability to continually improve own strengths		
	Ability to discover and resolve the problem in society	Problem setting	
		Hypothesis planning	
		Hypothesis testing	
		Practice	
	Fundamental Competencies for Working Persons	Ability to step forward	
		Ability to think through	(4)
		Ability to work in a team	(4)
Professional ethics			

12. Evaluation

Goals	Evaluation method & point allocation					
	examination	Quiz	Reports	Presentation	Deliverables	Other
(1)		○		○	○	
(2)		○		○	○	
(3)		○		○	○	
(4)				○		
(5)						
(6)						
Allocation		60		30	10	

13. Evaluation Criteria

Examination	
Quiz	Quiz homework in every week evaluates students understand the key contents of the lectures and materials.
Reports	
Presentation	Studetns research and present a topic he choose. Presentation contents, materials and skill are evaluated by peer reviews by students.
Deliverables	Evaluates the participation and understanding of the excersize in the class
Other	

14. Active Learning

Hourly percentage of active learning within the whole class time		30%
1	Active learning such as problem solving assignment using the knowledge and skills acquired in class.	Sometimes
2	Active learning such as group works and discussions.	Sometimes
3	Outcome presentations and feedbacks.	Sometimes
4	Students actively make decisions on how the class should be conducted.	Not at all

15. Notes

Class materials are offered through Moodle. Your PC (Windows, Mac or Linux) and the Internet connection are required for the class and homeworks.

16. Course plan

(Notice) This plan is tentative and might be changed at the time of delivery

Lesson 1: Overview of Information network (Lecture 90min.)

Course introduction and overview of various technologies information networks.

1. Course logistics (learning goal, grade evaluation, etc.)
2. History of Information networks
3. Overview of Internet Communication
4. Binary Numbers and Digital Data

Lesson 2: Layered Structure of Networks and Digital information

(Lecture 60 min., Exercise 30 min.)

Overview of TCP/IP network and its layered structure

1. Layered Structure of Information Network
2. Details of each Layer
3. Standards for Information Network
4. Digitizing (Encoding) various information

Lesson 3: Connecting Devices: Network Interface Layer

(Lecture 60 min., Exercise 30 min.)

Various Network Interface Layer technologies used for Internet

1. Ethernet (Wired LAN)
2. Wi-Fi (Wireless LAN)
3. WLAN Security
4. Connecting to the Internet and WAN

Lesson 4: Ethernet Switches and WLAN Access point

(Lecture 60 min., Exercise 30 min.)

The address, frames of network intreface layer and function of ethernet switches and WLAN access points.

1. MAC address and Ethernet frame
2. Switching Hub Operation
3. Wifi Access Point

Lesson 5: Network of Network : The Internet

(Lecture 60 min., Exercise 30 min.)

Internet layer connect the networks to form the global Internet

1. Network of Networks
2. IP Address (Address for the Internet)
3. Assignment of Global IP address
4. Private IP address

Lesson 6: Communication using IP packets

(Lecture 60 min., Exercise 30 min.)

Understand how the Internet IP address is used.

1. IP packets
2. Structure of IP address
3. Communication inside a network segment
4. Inquiring MAC address for an IP address

Lesson 7: Delivering Packets to the world (Routing)

(Lecture 60 min., Exercise 30 min.)

Understand how the routers connect networks to enable the global communication.

1. Communication to another network segment
2. Routing control
3. Communication using IP addresses

Lesson 8: IPv6

(Lecture 60 min., Exercise 30 min.)

IPv6, the next generation network technology

1. Background of the deployment of IPv6
2. IPv6 address
3. IPv6 Plug and Play
4. Transition to IPv6

Lesson 9: ICMP and UDP（Transport Layer）

(Lecture 60 min., Exercise 30 min.)

Understand ICMP and transport layer UDP functions.

1. ICMP, ICMPv6
2. Transport layer and session
3. UDP (User Datagram Protocol)

Lesson 10: Reliable Communication: TCP(Transport Layer)

(Lecture 60 min., Exercise 30 min.)

The function and behavior of TCP(Transmission Control Protocol)

1. Reliable Transport Layer: TCP
2. TCP Packets and connection process
3. TCP flow control and congestion control
4. NAPT (Network Address and Port Translation)

Lesson 11: World Wide Web （Application Layer）

(Lecture 60 min., Exercise 30 min.)

The basic mechanism of WWW (World Wide Web) which is widely used on the Internet.

1. Application layer
2. URL and domain name
3. How name resolution (DNS) works
4. HTTP protocol

Lesson 12: Web(continued) and Electric Mail

(Lecture 60 min., Exercise 30 min.)

Web mechanism (continued) and its security. E-mail systems

1. HTML
2. Dynamic Web
3. Secure Internet communication: SSL/TLS
4. Electric Mail

Lesson 13-14: Student Presentation (Presentation 180 min.)

Groups of Student select a theme related to network applications, research about it, and present the results.

Lesson 15: Summary of Information Networks

(Lecture 60 min., Exercise 30 min.)

Review and Summary of what you have learn in this course. Additional and/or advanced topics as necessary.