1. Course Code

2201

2. Course Title

F40e: Fundamentals of Information Networks

3. Teacher

SHIMA, Hisato

4. Term

Fall 1

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

None.

6. Course Overview and Objectives

In this course, you will learn about the technologies and applications of information networks and the Internet, which are indispensable for daily life and various businesses. Learn technologies such as the link layer, network layer, transport layer, and application layer that support the Internet, and understand how applications use them.

7. Course Outline

1 Overview of Information network
2 Layered Structure of Networks and Digital information
3 Connecting Devices: Various Link Layer Technologies
4 Link Layer Addresses and behavior
5 Network of Network : The Internet
6 Communication using IP packets
7 Delivering Packets to the world: Routing
8 IPv6 and Advanced link layer functions
9 ICMP and UDP（Transport Layer）
10 Reliable Communication: TCP(Transport Layer)
11 World Wide Web （Application Layer）
12 Web(continued) and Electric Mail
13 Student Presentation
14 Student Presentation
15 Network Application for IoT. Summary of Information Networks
16

8. Textbooks (Required Books for this course)

None

9. Reference Books (optional books for further study)

There are many good books for computer networks. One of the recommended books is
Title: Computer Networking: A Top-Down Approach
Author: James F. Kurose, Keith W. Ross

10. Course Goals (Attainment Targets)

(1) To understand mechanism of the each layers of TCP / IP protocol.
(2) To understand the functions of various network devices.
(3) To understand URLs, DNS, HTTP and web server mechanism
(4) To work in a group to research and present about network applications.
(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)						
(7)						
(8)						
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 as pdf files. 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. Digital representation of various information

Lesson 3: Connecting Devices: Various Link Layer Technologies	(Lecture 60 min., Exercise 30 min.)

Various Link Layer technologies used to connect devices to the Internet

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

Lesson 4: Link Layer Addresses and behavior	(Lecture 60 min., Exercise 30 min.)

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

1. Address for the Link Layer
2. Frame for the Link Layer
2. How a Switching Hub works?
3. How a Wifi Access Point works?

Lesson 5: Network of Network : The Internet	(Lecture 60 min., Exercise 30 min.)

The structure of the Internet and IP address

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

Lesson 6: Communication using IP packets	(Lecture 60 min., Exercise 30 min.)

Understand how the Internet IP address is used.

1. IP packets
2. Communication inside a network segment
3. Communication to another network segment
4. Private Address and NAT

Lesson 7: IPv6	(Lecture 60 min., Exercise 30 min.)

IPv6, the next generation network technology

1. Background of the deployment of IPv6
2. IPv6 address and operation
3. Transition to IPv6

Lesson 8: Advanced Network functions and Technologies for IoT	(Lecture 60 min., Exercise 30 min.)

Advanced Functions to support Real-life Network.
Network technologies for IoT Applications

1. Advanced link layer functions
2. VPN (Virtual Private Network)
3. Networks technologies for IoT applications

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 a 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: Internet and Security	(Lecture 60 min., Exercise 30 min.)

Security of the Internet

1. Malware and Security of client computers
2. Security of Server computers
3. Honeypots and Network Monitoring