1. Course Code

2222

2. Course Title

G61e: Advanced Information Network

3. Teacher

YOKOYAMA, Teruaki

4. Term

Fall 1

5. Course Requirements (Courses / Knowledge for this course) and Important Information

Fundamentals of Computer Systems
Fundamentals of Information Networks

6. Course Overview and Objectives

This course aims to equip students with practical network technology skills by focusing on server/network construction and utilization within the AWS cloud environment. Through fundamental AWS cloud usage, students will gain knowledge about server and network operations. You'll gain an understanding of servers and networks, and learn how to use AWS cloud services. By engaging in lectures and exercises, students can strive to become highly sought-after cloud engineers with expertise in networking.

7. Course Outline

1 Introduction to the Course, Course Goals & Evaluation
2 Introduction to Cloud Computing and AWS
3 Hands-on AWS (EC2 & SSH Basics)
4 Hands-on LAMP Server Setup
5 Hands-on AMI and Infrastructure as Code (IaC)
6 Hands-on AWS CLI for EC2 Operations
7 Web Server & API Separation with VPCs
8 Hands-on EC2 Server & API Integration
9 Hands-on S3 for Persistent Storage
10 Hands-on DynamoDB for Database Operations
11 Hands-on AWS Lambda (Serverless Migration)
12 Hands-on Lambda Function Chaining & AI Integration
13 High Availability & Load Balancing with ALB
14 Security Enhancements with WAF & Basic Authentication
15 Conclusion
16

8. Textbooks (Required Books for this course)

None

9. Reference Books (optional books for further study)

Introduce official documents and other resources provided by AWS.

10. Course Goals (Attainment Targets)

(1) Be able to explain cloud systems, using AWS cloud as an example.
(2) Be able to perform basic operations on cloud systems, using AWS cloud as an example.
(3) Be able to design and build multi-tier web service architectures on the cloud.
(4) Be able to explain the importance of serverless and container technologies and their use cases.
(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)
	Specialized knowledge and literacy		(2),(3)
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	
		Ability to work in a team	
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		40	

13. Evaluation Criteria

Examination	
Quiz	
Reports	Assess your knowledge of IP networking and cloud technologies across various topics and present your findings based on the cloud based products you created.
Presentation	
Deliverables	Build the specified system or other components on the AWS cloud and report the results.
Other	

14. Active Learning

Hourly percentage of active learning within the whole class time	20%

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

For those students who are progressing quickly and are willing, we will ask them to assist other students.
For students who lack confidence in participating alone, we will offer options such as joining a group.

16. Course plan

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

Lesson 1: Introduction to the Course, Course Goals & Evaluation (Lecture 90 min)

In this lecture, we will explain the course content, objectives, and evaluation methods. We will review the fundamentals of the Web and networking (IP, HTTP, etc.) and discuss the core benefits of cloud computing, such as agility and scalability.

Lesson 2: Introduction to Cloud Computing and AWS (Lecture 90 min)

In this lecture, we will discuss what cloud computing is and provide an overview of AWS. We will explore the key benefits of using the cloud over traditional on-premise solutions.

Lesson 3: Hands-on AWS (EC2 & SSH Basics) (Exercise 90 min)

In this exercise, we will guide students through creating an AWS account and performing basic console operations. We will then launch an EC2 instance and practice connecting to it using SSH.

Lesson 4: Hands-on LAMP Server Setup (Exercise 90 min)

In this lecture, we will conduct experiments to investigate network conditions using tools like ping and traceroute from a local PC, allowing you to experience the network firsthand. Additionally, in preparation for future use, we will register for an AWS Educate account to utilize the AWS cloud.

Lesson 5: Hands-on AMI and Infrastructure as Code (IaC) (Lecture 90 min)

In this lecture, we will learn about the overview of AWS, which we will be utilizing from now on. We will study the concepts of services provided within AWS, such as EC2 and VPC, which we will be using.

Lesson 6: Hands-on AWS CLI for EC2 Operations (Exercise 90 min)

In this exercise, students will learn to use the AWS Command Line Interface (CLI) to manage EC2 resources. This will help them become comfortable with command-line resource management.

Lesson 7: Web Server & API Separation with VPCs (Exercise 90 min)

This lecture will introduce the concept of multi-tier web service architecture, separating web servers from API servers. We will also cover the basics of VPCs and designing public and private subnets.

Lesson 8: Hands-on EC2 Server & API Integration (Exercise 90 min)

In this exercise, we will set up a multi-tier system with a web server in a public subnet and an API server in a private subnet. Students will practice configuring security groups to allow secure communication between them.

Lesson 9: Hands-on S3 for Persistent Storage (Exercise 90 min)

In this exercise, we will migrate the API server's data storage from local files to S3. This will demonstrate the durability and scalability of S3.

Lesson 10: Hands-on DynamoDB for Database Operations (Exercise 90 min)

In this exercise, we will replace the S3 file storage with Amazon DynamoDB. This will highlight the benefits of a structured database, such as better searchability and performance.

Lesson 11: Hands-on AWS Lambda (Serverless Migration) (Exercise 90 min)

In this exercise, we will introduce the serverless concept by migrating the API server's functionality from an EC2 instance to a serverless AWS Lambda function.

Lesson 12: Hands-on Lambda Function Chaining & AI Integration (Exercise 90 min)

In this exercise, we will build a Lambda function chain. Students will learn to invoke Amazon Translate and Comprehend from the main API Lambda to add translation and sentiment analysis to the chat system.

Lesson 13: High Availability & Load Balancing with ALB (Lecture 90 min)

This lecture will cover high availability and load balancing. We will perform an exercise to set up an ALB and discuss the importance of designing systems that span multiple Availability Zones.

Lesson 14: Security Enhancements with WAF & Basic Authentication	(Lecture 90 min)
This lecture will introduce security enhancements for web services. We will perform an exercise to set up a WAF and Basic Authentication on an EC2 instance.	

Lesson 15: Conclusion	(Lecture 90 min)
In this lesson, we will briefly review the course content from the 1st up to 14th lesson to confirm and support the students' understanding.	