

**1. Course Code**

2245

**2. Course Title**

Advanced Software Developments (Cloud Computing)

**3. Teacher**

WANNOS, Muhammad

**4. Term**

Spring 2

**5. Course Overview and Objectives**

This course serves as an introduction to Cloud Computing environment. It is designed to show how different technologies are used in to realize Cloud Computing and how to use this environment for hosting web applications.

This course implements PBL as an instructional approach. It includes several practical activities on building a Cloud and on utilizing Cloud services provided in the public domain.

The course also introduces a project on designing and deploying an application in the Cloud.

**6. Course Goals (Attainment Targets)**

- (1) Define Cloud Computing.
- (2) Describe the infrastructure of the Cloud.
- (3) Explain the different service models of the Cloud and compare them
- (4) Experiment with a simple system to provide Cloud services.
- (5) Experiment with one of the public Cloud service provider.
- (6) Practice designing and deploying a sample web application in the Cloud.

**7. 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		(4) (5) (6)
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			

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

A previous architectural knowledge of Cloud Computing is not required, but the following courses are required to be completed.

- [1] Fundamentals of Information Networks (2201)
- [2] Web application development (2249)

### 9. Textbooks (Required Books for this course)

For this course, a set of lecture slides, handouts, and other resources will be distributed in a timely manner through Moodle.

### 10. Reference Books (optional books for further study)

[1] Cloud Computing: A hands-on Approach, ISBN-13: 978-1494435141

[2] Learning Openstack, ISBN-13: 978-1783986965

### 11. Evaluation

Goals	Evaluation method & point allocation					
	examination	Quiz	Reports	Presentation	Deliverables	Other
(1)		○				
(2)		○				
(3)		○				
(4)					○	
(5)					○	
(6)					○	
Allocation		40			60	

### 12. Notes

This course contains both theoretical and practical parts. Be prepared for using the shell interface and for coding (in Java).

Quizzes and projects have deadlines and they won't be postponed unless a serious issue occurs.

### 13. Course plan

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

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Lesson 1: (Course orientation, Definition and characteristics of Cloud Computing)

(Discussion and Lecture 45 minutes, Demonstration, 45 minutes)

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[1] Course syllabus

[2] Grading

[3] Definition and characteristics of Cloud Computing

- + An overview of Cloud Computing and its characteristics.

- + Demonstration of deploying a sample project in Google App Engine.

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Lesson 2: (Cloud services, deployment models, and applications)

(Discussion and Lecture, 90 minutes)

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[1] Service models.

[2] Deployment models (SaaS, PaaS, and IaaS).

[3] Examples of a number of Cloud-based services and applications.

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### Lesson 3: (Cloud concepts and technologies -Virtualization-)

(Lecture 30 minutes, Practice, 60 minutes)

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#### [1] An overview of the technologies utilized for Cloud Computing

- + Virtualization
- + Load balancing
- + Replication...etc.

#### [2] Lab-work: installing a Virtual Machine (which is one of the main resources in Cloud Computing) using VirtualBox (group work).

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### Lesson 4: (Cloud concepts and technologies -SDN and Load balancing-)

(Lecture 30 minutes, Practice, 60 minutes)

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#### [1] An overview of the network solutions in Cloud Computing (Software Defined Network)

#### [2] Lab-work: use VirtualBox to construct a network of Virtual Machines

- + Test network connectivity
- + Test Load Balancing (HAProxy)

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### Lesson 5: (Cloud services and platforms)

(Discussion and Lecture, 90 minutes)

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#### [1] An overview of the Cloud services

- + Compute
- + Storage
- + Database
- + Application
- + Contents delivery...etc.

#### [2] Examples of these services.

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### Lesson 6: (Open source private cloud software -OpenStack 1-)

(Lecture 30 minutes, Practice, 60 minutes)

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#### [1] An overview of open source software used for managing clouds

- + CloudStack
- + OpenStack

#### [2] Lab work: download and configure a Virtual Machine provided by Oracle to test OpenStack on VirtualBox (group work).

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### Lesson 7: ((Open source private cloud software -OpenStack 2-))

(Practice, 90 minutes)

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In this session, we continue the lab work we started in the previous session and try to experience the use of OpenStack software pre-installed on the Virtual Machine (group work).

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## Lesson 8: (Review)

(Discussion, 90 minutes)

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In this session, we go through the main points we have studied so far in order to confirm what we have learnt and answer any questions about the concepts of Cloud Computing.

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## Lesson 9 : (Cloud Application Design -1-)

(Lecture 30 minutes, Practice, 60 minutes)

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[1] An overview of the design considerations and the reference architecture for Cloud applications.

[2] Introduction of Cloud application design methodologies.

[3] Sample web application (document storage)

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## Lesson 10 : (Cloud Application Design -2-)

(Practice 90 minutes)

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[1] Lab work: starting a new Cloud project on Google Apps Engine.

[2] Setting up the development environment

- + NetBeans IDE (including Google App Engine plugin)

- + Google Cloud SDK.

- + Google App Engine Java SDK

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## Lesson 11 : (Cloud Application Design -3-)

(Practice 90 minutes)

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[1] Lab work: creating the first web application in our Google App Engine project.

- + use Google Cloud SDK to create the application.

[2] Deploying a sample 'Hello World' application to our Google App Engine project.

- + Use NetBeans IDE to create the application and build it.

- + Use Google App Engine Java SDK to deploy the application to Google App Engine.

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## Lesson 12 : (Cloud Application Design -4-)

(Practice 90 minutes)

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[1] Lab work: import the document storage application and build it in NetBeans IDE

[2] Examining the source code of the application.

[3] Deploying the application from NetBeans IDE.

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## Lesson 13 : (Cloud application benchmarking)

(Lecture 30 minutes, Practice, 60 minutes)

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[1] Benchmarking of web applications.

[2] Lab work: use Apache JMeter to test our Cloud application.

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Lesson 14 : (Cloud Application Security, Security Scanner)

(Discussion and Lecture, 90 minutes)

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Discuss Cloud Application security and the tools available for checking it from the service providers.

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Lesson 15 : (Wrap up)

(Discussion, 90 minutes)

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[1] Discuss and review the topics covered in this course.

[2] Suggestions of improvements.

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