COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Industrial Design and Production Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**9003**	**SEMESTER**	**9**
COURSE TITLE	Cloud Computing		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Theory (Lectures)	3	3
Tutorial/Project	0.5	1
Laboratory	0.5	1
	4	**5**

COURSE TYPE	Specialized general knowledge, skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE301/

(2) LEARNING OUTCOMES

Learning outcomes

The course aims to present the basic concepts and important capabilities offered today by cloud computing, to understand the supporting technologies and infrastructure required, to analyze the individual systems and techniques, to delve into programming technologies and application development , in the demonstration of the most important services offered, and in the application of all the above in areas of real problems and further research with emphasis on industrial applications and environments.
Upon successful completion of the course the student will be able to:

- recognize the basic features and capabilities provided by cloud computing, on which technologies its development is based, what are the distribution and service models it supports, etc.
- understand what virtualization and virtual machines are, how they communicate with operating systems, how they are used in cloud computing, and how they are integrated into clusters and datacenters
- explore and apply modern techniques and methodologies of analysis and design of systems and infrastructure in the cloud
- delve into the architecture of applications, systems and distributed services over the cloud, and the mechanisms of distributed management, load distribution and balancing , and its high availability
- understand what cloud platforms and OS are and how to use them to develop integrated cloud solutions
- evaluate and design integrated solutions to transfer a company's cloud computing infrastructure and applications
- use programming technologies, integrated libraries, interfaces and tools offered for application / service development and cloud computing
- handle and utilize cloud applications and services offered to the end user by the various providers

- analyze advanced concepts of cloud computing, such as: capacity planning, workloads distribution, resource provisioning, load balancing, elasticity, high availability, cloudonomics, etc.

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work
- Adoption to new situations
- Working in an interdisciplinary environment
- Production of new research ideas
- Production of free, creative and inductive thinking

(3) **SYLLABUS**

The theoretical part of the course covers the sections:

1. Introduction to Cloud Computing: Definitions, key features, on which technologies its development is based, capabilities on the part of the developer and end user. The NIST model. The cloud cube model. Distribution and service models. IaaS, PaaS and SaaS concepts. The concepts of private, public, community and hybrid clouds, etc.
2. Virtual Machines - Computer Arrays - Datacenters: What are virtual machines and virtual machines (virtual machines - virtualization, types of hypervisor and supported types, containers, etc.),
3. Intermediate Software - Development Platforms: What are the interfaces and related development tools / platforms (toolkits / cloud platforms) and what is their importance for the development of services in the cloud, interface with lower levels (e.g. virtual machines)
4. Integrated service systems in the cloud (e.g. amazon), representative implementations e.g. Nimbus, Eucalyptus, OpenNebula, CloudStack, OpenStack etc.
5. Architectures - Design Issues: Cloud reference model, Capacity planning, Resource provisioning, auditing and monitoring. Workloads distribution, Load balancing, Resource pooling, Load testing and resource ceilings, Dynamic scalability, Elasticity. Cloud serverless architecture. Cloud computing & IoT (fog computing), etc.
6. Programming technologies - application development and scientific computing in the cloud: Available technologies and integrated libraries, integration of interactive applications and high-demand computing, interfaces required. Overview of relevant languages and tools (scripting languages, development tools, APIs - web services, microservices technology, etc.). Distributed file systems and big data management. Examples of usage and practice in the environments (indicative) of GAE / Google APIs and Hadoop / MapReduce, Spark.
7. Cloud applications / services for the end user: hosting services, office automation and collaboration services, web and mobile applications development services, big data processing and analysis services (big data processing and analytics), Overview of the main vendors (Google, Microsoft, Amazon etc.) and their services.
8. Integration technologies and environments (integration frameworks), integration process design and modern methodologies

In the laboratory part of the course, students are introduced to cloud technologies, virtualization and integration such as Docker, Kubernetes, OpenStack. They design and develop application for industry.

(4) TEACHINGandLEARNINGMETHODS-EVALUATION

<table>
<tr><td>DELIVERY</td><td>

Lectures
Practice Exercises
Laboratories
Assignments-Presentations

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<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of ICT in teaching, laboratory education (open source packages like VirtualBox), in submission of assignments and communication with students</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semesterworkload</th></tr>
<tr><td>Lectures</td><td>40</td></tr>
<tr><td>Laboratories</td><td>30</td></tr>
<tr><td>Assignments</td><td>40</td></tr>
<tr><td>Personal study</td><td>40</td></tr>
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<tr><td>Course total (30h/ECTS)</td><td>150</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
Language of Assessment
Greek
Description
Written exams, laboratory evaluation and project evaluation
Student assessment methods
Methods of evaluation for theory (60%):
- Final written exam with problem solving (100%)
Methods of evaluation for Lab (40%)
- Public Presentation
Methods of evaluation:
• Written Exam: 60%
• Assignments: 40%

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.
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(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, 2013. [Ελληνική Μετάφραση: Σαμαράς Ιωάννης, Εκδόσεις Γκιούρδας, 2015]
- Velte Anthony T.,Velte Toby J.,Elsenpeter Robert P., "Cloud computing Μιαπρακτικήπροσέγγιση". 2010 (Κωδικός Ευδόξου 12250)
- Dan C. Marinescu, Cloud Computing: Theory and Practice, Morgan Kaufmann, 2013.
- Kris Jamsa, Cloud Computing, Jones & Bartlett Learning, 2012.
- Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.
- Kai Hwang, Jack Dongarra, and Geoffrey Fox, Distributed and Cloud Computing, Morgan Kaufmann, 2011.

- Related academic journals:

- Transactions on Cloud Computing, IEEE
- Journal of Cloud Computing, Springer
- Future Computing and Informatics Journal, Springer