MODULE **DESCRIPTOR**

MODULE TITLE	Cloud Computing		
MODULE CODE	CO3721 (L6)	CREDIT VALUE	20 / 10 ECTS
SCHOOL	SCHOOL OF SCIENCE		

MODULE **AIMS**

Cloud computing has become a critical area of IT for both businesses and users. Commercial Cloud vendors provide access to an enormous pool of resources and services using different Cloud models in a pay-as-you-go fashion. These resources offer opportunities for rapid development and deployment of new applications in the areas of health-care management, malware analysis, smart homes, smart cities, etc. Popular applications such as Dropbox, Google Drive, and Amazon are developing more and more services that will play an increasing role in people's lives.

This module aims to introduce the fundamental concept of Cloud storage and computing services. In addition, the module will cover different models and architecture of Cloud services, as well as the security, privacy and accountability problems in this context. Specifically:

- To engage with current trends and the need for Cloud computing.
- To develop an appreciation of different Cloud models and architectures.
- To critically evaluate the security, privacy and accountability problems in the Cloud.
- To explore the most recent R&D directions/topics in Cloud computing and discuss their limitations and advantages.
- To review important research papers, extract and present their ideas and limitations, and make suggestions for improvements.

MODULE **CONTENT**

Indicative Syllabus Content
- Legal and Ethical aspects of Cloud services
  - Data Protection laws
  - Laws related to data controller and processor
  - Laws related to privacy problems
  - Laws related to accountability problems
  - Jurisdiction/cross-border issues
- Different Cloud service models
  - IaaS (Infrastructure - as - a - service)
  - PaaS (Platform - as - a - service)
  - SaaS (Software - as - a - service)
  - EaaS (Enterprise – as – a - service)
- Different Cloud architectures
  - Software and Hardware architectures
  - Private Clouds
  - Virtualisation for Clouds
    - Overview of virtualisation technologies (i.e., full and partial virtualization, hardware-assisted virtualisation);
    - Virtual machines.
    - Study of example technologies such as VMware's ESXi hypervisor, Xen.
- Security and Privacy problems related to the Cloud
  - Encryption modes
    - End-to-end encryption
    - Server side encryption
    - Homomorphic encryption

- o Authentication modes
- o End-to-end accountability
- o Virtualisation security
- Applications areas/Research topics
  - o Big data analysis e.g. use of technology such as Hadoop
  - o Health-care management in the Cloud
  - o Malware analysis in the Cloud
  - o Mobile Cloud computing
  - o Internet of things and Cloud computing
  - o Vehicular Cloud computing
- Business perspective of Cloud services
  - o Cloud economics
  - o Business continuity

Syllabus content may vary according to current knowledge and practices.

INTENDED **LEARNING OUTCOMES**

On successful completion of this module a student will be able to:

1.	Analyse and compare different Cloud architectures
2.	Critically evaluate security, privacy and accountability issues in Cloud services
3.	Critically review the most recent research and development directions/topics in Cloud computing
4.	Identify and discuss the limitations and advantages of advanced Cloud technologies.

TEACHING METHODS

Lectures – to analyse material and to present an overview of key concepts. These will be interactive in nature. If possible, there will be some guest lectures undertaken by academic and industry practitioners. Tutorials – to apply techniques to case study material, e.g. assessing the appropriateness of the cloud for a given scenario. Work in tutorials will vary. Sometimes students will be asked to work in groups, at other times they will work individually, and then discuss their work in pairs or with the whole group. Example practical work includes: investigating security, cloud functionality and performance.

Assessment will include literature-based research and may involve the evaluation of Cloud technologies or the analysis of a case-study and the recommendation of appropriate technologies. The poster will assess the ability to identify and discuss key aspects of Cloud technologies.

ASSESSMENT METHODS

This module is assessed through a research paper (80%) and a poster (20%).