**Cloud Computing**

**Department of Electrical and Computer Engineering**

**Course Description**

Clouds are distributed technology platforms that provide highly scalable and resilient virtual computing environments. The course presents the concepts, models, architectures, and technologies that are at the core of cloud computing. We introduce concepts from an industry-centric and vendor-neutral point of view. The course uses Amazon AWS, Microsoft Azure, and Google Web Services as vehicles to discuss concrete examples and for completing required course projects. Students will be asked to work on biweekly assignments and to develop a course project demonstrating their understanding of the major concepts presented in this course.

**Catalog Description**

EE-655/EE-755 Cloud Computing, 3 hours.

Clouds are distributed technology platforms that provide highly scalable and resilient virtual computing environments. The course presents the concepts, models, architectures, and technology that are at the core of cloud computing.

**Learning Outcomes**

1. Evaluate the trade-offs between deploying applications in the cloud and over the local infrastructure.
2. Deploy and manage applications over the cloud, such as Amazon Web Services, Windows Azure, and Google Cloud.
3. Compare the pros and cons of various cloud computing platforms.
4. Identify security and privacy issues related to cloud computing.
5. Analyze, design and implement aspects of an Internet of Things solution.

**Recommended Textbook**

The Practice of Cloud System Administration, Authors: T. Limoncelli, S. Chalup, and C. Hogan, Publisher: Addison Wesley, Volume 2, 2015, ISBN-13: 978-0-321-94318-7.

**Other References**

1. Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS), Publisher: Wiley; first edition, 2014.
2. Cloud Computing Bible, Author: B. Sosinsky, Publisher: John Wiley, 2011

**Prerequisites**

Knowledge of: Object-Oriented Programming language (such as Java), data structures, and HTML.

**Computing Requirements**

A computer Lab will be available for working on assignments with computers that meet the requirements given below.  Students have the option to work on their own computer provided they meet the same hardware and software requirements:

1. A computer with Windows 7, 8, with a minimum of 4 GB memory, 500 GB of disk space, and 1200x800 screen resolution
2. The Java Development Kit (JDK), version 7, downloadable from <http://www.oracle.com>

**Assessment**

Midterm 25%

Final 25%

Biweekly assignment 50%

The course project will consist of the five phases listed below. Each phase is to be submitted for feedback and evaluation:

* + Developing the requirements
  + Designing of the application and the user interface
  + Writing code and testing
  + Publishing to the cloud

**Topics Covered**

1. **Introduction to Cloud Computing**

* Defining Cloud Computing
* Characteristics of Cloud Computing
* Benefits and limitations

1. **Virtual Machines**

* The Azure Cloud Platform
* Virtual Machine Images
* Configuring VMs
* Connecting remotely to VMs
* Managing Disks on VMs
* Running a Web Server on a VM

1. **Networking on the Cloud**

* Networking concepts
* Virtual Networks
* Subnetting
* Network security groups

1. **Case Study**

* Multi-tier architecture
* Configuring public an private access to VMs
* Securing access to resources

1. **Cloud-based Storage**

* Creating an SQL Database in the Cloud
* Configuring the Database and setting up a firewall
* Accessing the Database with Visual Studio
* Using apps to access the database

1. **Tools for the Cloud**

* Visual Studio Development Environment
* Developing Applications for the Cloud
* Building, running, and debugging cloud servises

1. **Developing Web Applications on the Cloud**

* The LAMP architectural model
* Setting up Linux, Apache, MySQL, and PHP
* Installing and Configuring the software on the VM

1. **Cloud-based Mobile Services**

* Developing Mobile Apps
* App access to Cloud-based Databases
* Configuring App databases

1. **The Internet of Things**

* IoT cloud Architecture
* REST Web Services, NodeJS
* MQTT Messaging, NoSQL Databases

1. **Design of IoT in the cloud**

* The Bluemix Cloud platform
* The Node-RED Development Environment
* Designing IoT processes
* Running and Visualization of IoT process