College of San Mateo
Official Course Outline

1. **COURSE ID:** CIS 500 **TITLE:** Introduction to Cloud Computing
   Units: 4.0 units **Hours/Semester:** 64.0-72.0 Lecture hours; and 128.0-144.0 Homework hours
   Method of Grading: Grade Option (Letter Grade or Pass/No Pass)
   Prerequisite: CIS 117, or CIS 254 or CIS 278

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU; UC

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   The course will provide students with a thorough treatment of cloud computing and its applicability to commercial application development as well as research computing needs. The lectures cover topics related to infrastructure and software stack, programming models (e.g., MapReduce and Pregel), underlying distributed storage layers (e.g., HDFS and HBase), as well as enabling technologies such as virtualization. Students will also be exposed to various cloud frameworks and libraries (e.g., Mahout, Pig, and Hive).

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Describe the Hadoop, MapReduce program flow and it communicates with the Hadoop distributed file system (HDFS).
   2. Identify several programming models such as Dryad, Pregel and GraphLab.
   3. Identify various Hadoop extensions which simplify large-scale data processing such as Apache Pig and Hive.
   4. Describe GFS, HDFS, BigTable, HBase and Dynamo.
   5. Use Amazon EC2 infrastructure.
   6. Use Google App Engine for software development.
   7. Understand Microsoft Azure platform.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Describe the Hadoop, MapReduce program flow and it communicates with the Hadoop distributed file system (HDFS).
   2. Identify several programming models such as Dryad, Pregel and GraphLab.
   3. Identify various Hadoop extensions which simplify large-scale data processing such as Apache Pig and Hive.
   4. Describe GFS, HDFS, BigTable, HBase and Dynamo.
   5. Understand Amazon EC2 infrastructure.
   6. Use Google App Engine for software development.
   7. Understand Microsoft Azure platform.

6. **COURSE CONTENT:**
   Lecture Content:
   System models and enabling technologies
   1. Distributed system models
   2. Software environments for distributed systems
   3. Computer clusters for scalable parallel computing
   4. Virtual machines and virtualization of clusters and data centers

   Computing clouds, service-oriented architecture, and programming
   1. Cloud computing platforms
   2. Cloud platform architecture over virtualized data centers
   3. Service-oriented architecture for distributed computing
   4. Cloud programming and software environments
   5. Performance evaluation framework of cloud platforms

   Cloud technologies
   1. Web services, AJAX and Mashups
   2. Multi-tenant software

   Cloud development
   1. Data in cloud

2. Cloud -hosted data storage system
3. Database replication of NoSQL Databased-as-a-Service
4. MapReduce and Extensions
5. SLA-Driven Database Replication on virtualized database servers

Enterprise cloud computing ecosystem

1. Grid computing system and resource management
2. Peer-to-peer computing and overlay networks
3. Ubiquitous clouds and internet of Things

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**

Typical methods of instruction may include:

A. Lecture
B. Activity
C. Discussion
D. Observation and Demonstration
E. Other (Specify): Student participation in short in-class projects. Students working in small groups to solve problems.

8. **REPRESENTATIVE ASSIGNMENTS**

Representative assignments in this course may include, but are not limited to the following:

Writing Assignments:

Students will complete assignments demonstrating mastery of material. These will be due at the beginning of class.

Reading Assignments:

Students will read lecture material assigned for each class prior to the class. Reading will be assigned at the end of preceding class.

Other Outside Assignments:

Weekly homework problems
Internet research

9. **REPRESENTATIVE METHODS OF EVALUATION**

Representative methods of evaluation may include:

A. Class Participation
B. Class Performance
C. Class Work
D. Exams/Tests
E. Homework
F. Quizzes
G. Written examination

10. **REPRESENTATIVE TEXT(S):**

Possible textbooks include:

A. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra. *Distributed and Cloud Computing, From Parallel Processing to the Internet of Things*, ed. Morgan Kaufmann, 2012
B. Tom White. *Hadoop: The definitive Guide*, 4 ed. O'Reilly Media Inc., 2015

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Course Originator: Kamran Eftekhari