

CSE 5333: Cloud Computing

Fall 2020

Instructor Information

Instructor(s):
Habeeb Olufowobi, Ph.D.

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TBD

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Office Hours:
Monday and Wednesday 2:00 - 3:30 pm (or by appointment via email w/ at least 24 hours notice)

Course Information

Section Information:
CSE 5333-001

Time and Place of Class Meetings:
4:00 - 5:20, MW.
Online Synchronous

Description of Course Content:

Cloud Computing has transformed the IT industry by opening the possibility for infinite or at least highly elastic scalability in the delivery of enterprise applications and software as a service (SaaS). Cloud computing is a method of computing where a shared group of resources such as file storage, web servers, data processing services, and applications are accessed via a public internet connection or a private VPN and/or direct network connection. Cloud computing gives mature enterprises and new start-ups the option to deploy their applications to systems of infinite computational power with practically no initial capital investment and with modest operating costs proportional to the actual use. Examples of cloud computing services include Amazon Web Services, Microsoft Azure, Google Cloud Platform and IBM Softlayer. This course introduces students to the fundamental and design concepts of writing software applications on the cloud. This course will discuss tools required by an application programmer in building, deploying, and maintaining cloud applications. A combination of lectures and lab activities will expose students to the programming interface utilized in developing cloud applications.

Student Learning Outcomes:

Course Aims

This course aims to teach students the following:

1. Understand basic concepts of cloud computing.
2. Understand the architecture and various cloud models such as SaaS, IaaS, and PaaS.
3. Understand the tradeoffs of deploying applications on system architectures using load balancing, sharding, and software defined networks.
4. Understand various security threats in cloud computing and ways to mitigate them
5. Understand various layers of cloud architecture and differentiate cloud service models
6. Understand the latest research trends in cloud computing.
7. Be able to deploy software applications on commercial cloud platforms

Course Outcomes

By the end of this course, students should be able to perform the following tasks:

1. Compare the advantages and disadvantages of various cloud computing platforms.
2. Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
3. Identify security and privacy issues in cloud computing.
4. Explain recent research results in cloud computing and identify their pros and cons.
5. Solve a real-world problem using cloud computing through group collaboration

Required Textbooks and Other Course Materials:

There is no required textbook for this class. Materials from different textbooks and research publications will be distributed every week.

Optional Text: "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, Zaigham Mahmood. Prentice Hall; 1 edition (May 20, 2013). ISBN-13: 978-0133387520

Descriptions of major assignments and examinations:

Following is the tentative outline. I will announce concrete dates in class.

- Homework: Throughout the course.
- Quizzes: Throughout the course.
- Project: Throughout the course.

As indicated in grading information, 20% of the grade in the class will be determined by the final group project. The project will be jointly agreed upon between the student groups and the instructor after the project proposal review. The students will manage their own time in working on the project with the exception of the final week of class, when they will have in-class time to work and ask questions.

Grading Information

Grading:

- Grade Components
 - 25% Homework
 - 30% In-Class Labs
 - 20% Quizzes
 - 20% Project
 - 5% Class participation

Project and homework will be graded on accuracy (satisfaction of requirements), clarification (comment, documentation and organization) and efficiency (execution conciseness). In general, a program that cannot compile, or crashes or stalls as soon as it starts will receive zero points. To avoid these errors, you are strongly recommended to fully test your programs before submission. Documentation is a major part of each project. Make sure you leave enough time to write it. Detailed justification must accompany the answers for written assignments.

- **Grade Distribution**

- A: 90 -100
- B: 80-89
- C: 70-79
- D: 60-69,
- F: less than 60.

Note, grades will not be curved in general and adjustable at the instructor's discretion.

Make-up Exams:

The university catalog lists under student responsibilities the following kinds of absences.

- University authorized absences
- Absence for military service
- Observance of religious holy days
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See the university catalog for details

(<http://catalog.uta.edu/academicregulations/studentresponsibility/#attendancetext>).

No make-up exams will be given unless there is a written doctor's excuse. In the event that such an excuse is accepted, the deadline will be extended the number of days specified in the excuse.

No extra credit should be requested for in general. Extra credit opportunities will be at the instructor's discretion and provided to the entire class, not individuals. Students are encouraged to check with the instructor for their progress in the course following each exam or major assignment/project.

Grade Grievances:

Re-grading request must be sent within a week of the date the graded material was returned to the class.

Requests for re-grading or any questions regarding graded material will not be accepted after that time.

Any graded material that is not picked up within two weeks after distribution will be discarded.

Course Schedule

Topics to be covered

1. Introduction to cloud computing
 - i. History and basic concepts
 - ii. Delivery models
 - iii. Cloud providers
 - iv. Security and data protection

2. Cloud infrastructure
 - i. Virtualization
 - ii. Networking
 - iii. Infrastructure as a Service
 - iv. Storage
 - v. Programming topics: Infrastructure as Code (Terraform)
3. Microservices and Containerization
 - i. Docker containers
 - ii. Kubernetes
 - iii. Istio
 - iv. Programming topics: Dockerfile creation, Kubernetes and Istio YAML
4. Serverless computing
 - i. Functions as a Service
 - ii. Platform as a Service
 - iii. Programming topics: Functions in Node.js and Python, Web serving in Java, Node.js, and Python
5. Big data, analytics, and data pipeline
 - i. Data storage options in cloud
 - ii. Batch data processing - MapReduce and Hadoop
 - iii. Stream data processing, including IoT
 - iv. Data warehouse
 - v. Programming topics: MapReduce, Apache Beam, SQL
6. Machine learning
 - i. TensorFlow
 - ii. Jupyter and notebooks
 - iii. Training and serving in the cloud
 - iv. Programming topics: ML with Python and TensorFlow
7. DevOps
 - i. Continuous integration
 - ii. Continuous delivery
 - iii. Reliability and operations
 - a. SLOs, SLIs, error budgets
 - b. Observability and monitoring
 - iv. Programming topics
 - a. Build and deployment automation with Spinnaker and Jenkins
 - b. Observability with OpenCensus

As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course

Institution Information

UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the [Institutional Information](http://www.uta.edu/provost/administrative-forms/course-syllabus/index.php) page (<http://www.uta.edu/provost/administrative-forms/course-syllabus/index.php>) which includes the following policies among others:

- Drop Policy
- Disability Accommodations
- Title IX Policy
- Academic Integrity
- Student Feedback Survey
- Final Exam Schedule

Additional Information

Attendance:

At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator of student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I have established the following attendance policy. Since this is a 3000-level course, I do not plan to take attendance directly. But attendance contributes indirectly to the final grade. Specifically, final grade components include in-class quizzes, class participation such as asking and answering questions during class, and in-class project presentations.

However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report must the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Canvas. This date is reported to the Department of Education for federal financial aid recipients.

Emergency Exit Procedures:

Should we experience an emergency event that requires evacuation of the building, students should exit the room and move toward the nearest exit, which is located to the left and down one flight of stairs if you exit through the left door. If you exit through the right door the nearest exit is located to the right, followed by a left turn, and down one flight of the stairs. When exiting the building during an emergency, do not take an elevator but use the stairwells instead. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Success Programs:

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring by appointment](#), [drop-in tutoring](#), [etutoring](#), [supplemental instruction](#), [mentoring](#) (time management, study skills, etc.), [success coaching](#), [TRIO Student Support Services](#), and [student success workshops](#). For additional information, please email resources@uta.edu, or view the [Maverick Resources](#) website.

The IDEAS Center (<https://www.uta.edu/ideas/>) (2nd Floor of Central Library) offers free tutoring and mentoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. Students can drop in or check the schedule of available peer tutors at www.uta.edu/IDEAS, or call (817) 272-6593.

The English Writing Center (411LIBR):

The Writing Center offers free tutoring in 15-, 30-, 45-, and 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Register and make appointments online at the Writing Center (<https://uta.mywconline.com>). Classroom visits, workshops, and specialized services for graduate students and faculty are also available. Please see Writing Center: OWL for detailed information on all our programs and services.

The Library's 2nd floor Academic Plaza (<http://library.uta.edu/academic-plaza>) offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation.

Librarian to Contact:

Each academic unit has access to Librarians by Academic Subject that can assist students with research projects, tutorials on plagiarism and citation references as well as support with databases and course reserves.

Emergency Phone Numbers

In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381