

# CS 5123: Cloud Computing and Distributed Systems Spring 2020

## Course Information:

Instructor: Arunkumar Bagavathi

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Office: MSCS 215

Spring 2020 Office hours:

Monday 3:00pm – 4:30pm;

Wednesday 10:30am - 12:00pm

Lectures: Tuesday, Thursday 10:30am – 11:45am

Classroom: Room 040 Stout Hall

Credits: 3

Teaching Assistant: Khaled Mohammed Saifuddin

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Prerequisites:

- CS 3443 Computer Systems (with 'C' or better grade) and
- CS 3353 Algorithms and Data Structures 1 (with 'C' or better grade)

OR permission of instructor

- ❖ Basic mathematical and programming skills are mandatory for assignments and project
- ❖ Fundamentals of Java programming, and linux terminal commands is required

Other information: The class will follow Canvas. All course announcements, assignments and project instructions, and course materials will be posted in Canvas

## Course Description

The course gives broad ideas and popular methodologies in cloud computing and distributed systems. The course mainly aims to use distributed computing frameworks like Hadoop MapReduce and Apache Spark for complex data-intensive problems like big data processing, web search, and machine learning. Course lectures, assignments and project will be designed to help students to understand the basics of distributed computing frameworks, cloud services and tools, data mining algorithms, and distributed clusters and servers to the students.

## Topics

Following is the tentative topics for the course. It is intended to change according to students need and availability of time.

1. Distributed Computing
  - ❖ Evolution of distributed computing – types and state-of-the-art
  - ❖ Hadoop MapReduce
  - ❖ Apache Spark
  - ❖ Spark MLlib
  - ❖ Spark GraphX
2. Applications
  - ❖ Web search
  - ❖ Basic data mining algorithms
3. Introduction to AWS
4. Security in cloud computing

## Course activities and Grading

The course activities consist of programming assignments, occasional quizzes, and a final project. There will be three to five assignments, each will involve significant amount of programming. Students will have one to two weeks to complete each assignment. All assignments will be due at 11:59:59 pm on the scheduled submission date. There will be at least 4 quizzes – one per each month. Quizzes will be conducted as closed book in-class tests. The final course project should be a significant implementation project and should have to be approved by the instructor. Project phases include: proposal, implementation, demonstration, and written summary. Grading for the project will be based on grades from all the project phases.

Tentative grading scheme for the course:

- Project: 45%
- Assignments: 35%
- Quiz: 10%
- Class participation: 10%

**Attendance Policy:** Students are expected to attend all sessions of the course and are responsible for knowing all materials covered in the class. A part of the student grade will be determined by class attendance and participation.

**Lateness Policy:** This is tightly organized class with assignments and projects. So, there will be no extra time given for assignment and project submission. If there is any good reason for extension, please email the instructor **in advance**.

## **Books:**

Books are not mandatory for this course. Use of online documentation is highly encouraged. Following are some good books for reading:

1. "Hadoop: The Definitive Guide", 4<sup>th</sup> Edition by Tom White
2. "Spark: The Definitive Guide", 2018 Edition by Bill Chambers and Matei Zaharia
3. "Distributed and Cloud Computing: From Parallel Processing to the Internet-of-Things" by Kai Hwang, Geoffrey C. Fox, and Jack J. Dongarra
4. "Introduction to Data Mining", Second Edition by Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, and Vipin Kumar
5. "Mining Massive Datasets", Second Edition by Jure Leskovec, Anand Rajaraman, and Jeffrey David Ullman

## **Alerts and Rescheduling:**

If the OSU campus officially closes due to inclement weather or other emergencies, alerts are provided to local news media and posted on the OSU website. Missed exams, classes, or assignments may be rescheduled at times outside the normal meeting schedule. If valid, documented circumstances prohibit students from attending the rescheduled classes, instructors should provide reasonable alternative means for makeup.

## **Academic Integrity:**

101 Whitehurst/405-744-5627/<http://academicintegrity.okstate.edu>

OSU is committed to maintaining the highest standards of integrity and ethical conduct. This level of ethical behavior and integrity will be maintained in this course. Participating in a behavior that violates academic integrity (e.g., unauthorized collaboration, plagiarism, multiple submissions, cheating on examinations, fabricating information, helping another person cheat, unauthorized advance access to examinations, altering or destroying the work of others, and altering academic records) will result in an official academic sanction. Violations may subject you to disciplinary action including the following: receiving a failing grade on an assignment, examination or course, receiving a notation of a violation of academic integrity on your transcript, and being suspended from the University. You have the right to appeal the charge.

## **Copyright & Fair Use Policy Of course Materials**

Course materials may not be published, leased, sold to others, or used for any purpose other than appropriate OSU-related individual or group study without the written permission of the faculty member in charge of the course and other copyright holders. This paragraph grants you a limited license giving you access to materials

for this course, including PowerPoint slides, audio/video recordings, written, or other materials, for appropriate OSU-related educational use only. Lectures should not be recorded without permission from the faculty member and must not be further disseminated or shared.

### **Pre-Finals Week Policy**

Final examinations are scheduled at the end of each semester and are preceded by pre-finals week, which begins seven days prior to the first day of finals. During pre-finals week, all normal class activities will continue; however, no assignment, test, or examination accounting for more than 5% of the course grade may be given; and no activity or field trip may be scheduled that conflicts with another class. This excludes makeup and laboratory examinations, out-of-class assignments (or projects) made prior to pre-finals week and independent study courses. No student or campus organization may hold meetings, banquets, receptions, or may sponsor or participate in any activity, program, or related function that requires student participation. For additional information, contact the Office of Academic Affairs, 405-744-5627, 101 Whitehurst.

### **Equal Opportunity**

409 General Academic Building/405-744-7607 <https://1is2many.okstate.edu/>

OSU is committed to maintaining a learning environment that is free from discriminatory conduct based on race, color, religion, sex, sexual orientation, gender identity, national origin, disability, age or protected veteran status. OSU does not discriminate on the basis of sex in its educational programs and activities. Examples of sexual misconduct and/or sex discrimination include: sexual violence, sexual harassment, sexual assault, domestic and intimate partner violence, stalking, or gender-based discrimination. OSU encourages any student who thinks that he or she may have been a victim of sexual misconduct or sexual discrimination to immediately report the incident to the Title IX Coordinator (405-744-7737) or Deputy Title IX Coordinator (405-744-5470). Students may also report incidents of sexual misconduct or sex discrimination to a faculty or staff member, who is then required by federal law (Title IX) to notify the Title IX or Deputy Title IX Coordinator. If a reporting student would like to keep the details confidential, the student may speak with staff in the Student Counseling Center (405-744-5472) or one of the University's Sexual Assault Victim Advocates (Mon-Fri 8 AM-5 PM, 405-564-2129 or 24 Hour Help Line 405-624-3020).

### **Student Accessibility Services**

1202 W. Farm Rd #155/405-744-7116/<http://sds.okstate.edu/>

According to the Americans with Disabilities Act, each student with a disability is responsible for notifying the University of the disability and requesting accommodations. If you think you have a qualifying disability and need accommodations, contact the Office of Student Accessibility Services to start the

registration process and to ensure timely implementation of appropriate accommodations. To receive services, you must submit appropriate documentation and complete an intake process to verify the existence of a qualified disability and identify reasonable accommodations. Faculty have an obligation to respond when they receive official notice of accommodations but are under no obligation to provide retroactive accommodations.

## **Student Conduct Education and Administration**

328 Student Union/405-744-5470/<http://studentconduct.okstate.edu/>

By enrolling at Oklahoma State University, you accept responsibility for complying with all University policies and contracts, and for local, state and federal laws on- or off-campus that relate to the University's mission. The Student Code of Conduct educates students about their civic and social responsibilities including policies and procedures involving student misconduct.

In general, the University expects students to aspire to follow and promote the Cowboy Community Standards or integrity, community, social justice, respect, and responsibility.

## **For More Information**

### **go.okstate.edu/apps**

The OState app is your link to campus departments, OSU news, and maps. The Orange Shield app is the official safety app of OSU.

### **my.okstate.edu**

This portal connects students to a wide range of campus services including links to student email, the library, and the Online Classroom and Community (D2L).

For other comments and inquiries, please contact [academics@okstate.edu](mailto:academics@okstate.edu).