CS 4740 Cloud Computing

Instructor: Prof. Haiying Shen, Associated Professor, Rice Hall, Room 303, hs6ms@virginia.edu
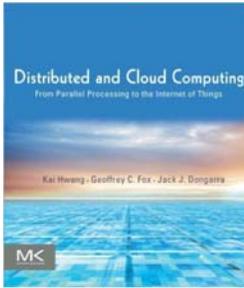**Office Hours:** 1:00PM-2:00PM (M) 12:30PM-1:30PM (W); other times by appointment, Rice Hall, Room 303
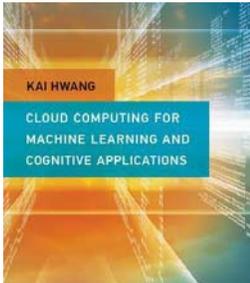**Homepage (for class schedule):** http://www.cs.virginia.edu/~hs6ms/
Course website: Course Collab for submitting project assignments

Course Materials: lecture slides

Reference book:

K. Hwang, G. Fox and J. Dongarra, Distributed and Cloud Computing: From Parallel Processing
to the Internet of Things
Morgan Kaufmann Publishers, 2012. (ISBN 978-0-12-385880-1)

K. Hwang, Cloud Computing for Machine Learning and Cognitive Applications
The MIT Press, 2017. (ASIN: B073RX8B2Y)

Prerequisites:
CS 2150 Program and Data Representation or CS 111x Introduction to Programming
CS 3330 Computer Architecture
CS 4457 Computer Networks or equivalent background approved by the instructor

Course Description: This course introduces a basic grounding in designing and implementing cloud systems. It aims to acquaint students with principles and technologies of server clusters, virtualized datacenters, Internet clouds, and applications. Students will have the opportunity to gain hands-on experience on public cloud such as Amazon EC2. Selected applications will also be used as case studies to gain hands-on experiences.

Objectives: By the end of the course, students will have:
- *Fundamental concepts.* Describe the basic concepts of general characteristics of cloud systems. Be familiar with networking fundamentals necessary for a distributed system design. Understand enabling technologies of cloud platforms. Describe the parallel computing and programming paradigms such as MapReduce.
- *Hands-on experience.* Gain hands-on experience in development of distributed algorithms and programming on real cloud platforms such as Amazon EC2.

Topics and Lecture Schedule (tentative):
- Overview of Distributed Computing
- Introduction to Cloud Computing
- Infrastructure as a Service (IaaS)
- Server Virtualization

- Platform as a Service (PaaS)
    - File system
    - Programming Model
    - Database
- Introduction to SaaS & Its Techniques
- Cloud Issues and Challenges
- MapReduce/Hadoop

Please refer to the instructor homepage for the lecture schedule.

Grading:

Programming Assignments: 20%

Homework: 20%

Midterm Exam (close book, close notes): 20%

Final Exam (close book, close notes): 20%

In-class Quiz: 20%

Extra Credit (Quiz) 5%

Final letter grades are not assigned according to an absolute scale. Based on final numeric scores, the instructor will draw cutoffs between letter grades as deemed appropriate.

Attendance: You are expected to attend every lecture in its entirety. Do not schedule other classes or commitment that conflict with any part of the lecture time. A low attendance will negatively affect the grading scale when the total grade is at a border line.

Homework Policy:
- Unless otherwise specified, assignments should be submitted through Collab and are due at 11:59pm on the due date. Programming solutions should be placed in each student's appropriate Collab directory.
- You are strongly encouraged to turn in the assignments before the deadline to account for any unpredictable situations. Please always work ahead and make backups to account for unexpected problems.
- Any questions regarding your scores of assignments and tests should be resolved within 3 days after the scores are released.
- No late assignment will be accepted. We will drop the assignment (including programming assignment and homework) with the lowest score.
- We will drop the two lowest in-class quiz scores.

Make-up Policy: Make-up will be allowed only for students having medical problems.

Examination Policy:

If you have any conflicts with the examination time, please notify the instructor during the first week. The following documentation is required for rescheduling of an examination:
- *Medical Excuse:* A signed letter from a physician from the day of the examination indicating that the student had a valid medical reason for missing school. This letter must be on the physician's letterhead and the name and phone number of the physician must be legible. (Note: For cases of extended medical treatment, the letter can be dated prior to the examination, if the physician's recommendation for leave extends beyond the examination date.)
- *Employment Conflict:* A signed letter from the student's direct supervisor indicating that an absence is required for the student's employment for the dates surrounding the examination.

- *Transportation Problem:* In the event that you are prevented from arriving on campus due to a transportation delay, one of the following should be provided
  - A copy of the police report concerning a traffic accident
  - A copy of the receipt for towing from a towing service

The final determination of the validity of an excuse is the jurisdiction of the faculty member. In all of the above instances, all reasonable attempts must be made to contact the faculty member to notify them of the problem BEFORE the examination. This can be done via email or via phone. If notice is not provided before the examination, no documentation will be accepted.

Honor Pledge Policy:

- The instructor will indicate which assignments and activities are to be done individually and which permit collaboration. You may DISCUSS a homework assignment with anyone in the class, including what a question means, how you might go about solving it, or even how you did solve it. You can discuss any material from the book or lecture that you consider relevant to the homework with anyone.
- You MAY NOT do any of the following:
  - LOOK at homework solutions written by anyone in the class.
  - COPY someone else's code or lab report or lab data, other than your partner's.
- There are no restrictions on what you can discuss with the instructor.
- You do not have to write the pledge on your assignments, although we will not mind if you do. Whether or not you do write it, we consider the pledge to be implicit when you hand in your homework.
- I trust every student in this course to fully comply with all of the provisions of the UVA honor system.

All work should be pledged in the spirit of the Honor System at the University of Virginia. For more information, visit www.virginia.edu/honor.

Special Needs:

It is the policy of the University of Virginia to accommodate students with disabilities in accordance with federal and state laws. Any student with a disability who needs accommodation (e.g., in arrangements for seating, extended time for examinations, or note-taking, etc.), should contact the Student Disability Access Center (SDAC) and provide them with appropriate medical or psychological documentation of his/her condition. Once accommodations are approved, it is the student's responsibility to follow up with the instructor about logistics and implementation of accommodations. Further policies and statements are available at www.virginia.edu/studenthealth/sdac/sdac.html.