

## CS 4740 Cloud Computing

**Instructor:** Prof. Haiying Shen, Associated Professor, Rice Hall, Room 303, [hs6ms@virginia.edu](mailto:hs6ms@virginia.edu)

**Class time:** 3:00pm-3:50pm, EST, (Mo, We, Fr), Rice Hall 130

**Course website:** UVA Canvas <https://canvas.its.virginia.edu/courses/132916>

**TAs:** Qichang Liu (nzc5ve), Zeyu Zhang (qxc4fh)

### Office Hours:

Prof. Shen: 3:50-4:50pm, MoFr, Rice Hall, Room 302

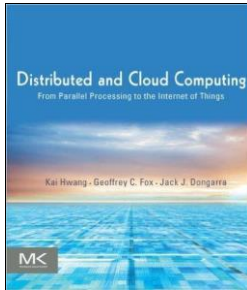
Qichang Liu: 3:50-4:50pm, MoFr, 2-3pm, TuWe, Rice Hall, Room 220

Zeyu Zhang: 3:50-4:50pm, MoFr, 1-2pm, WeTh, Rice Hall, Room 220

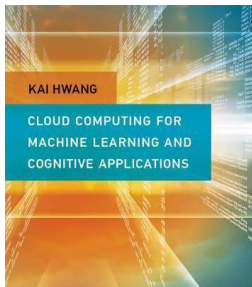
other times by appointment

**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. 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 (e.g., MapReduce/Hadoop)
- Database
- Introduction to SaaS & Its Techniques
- Cloud Issues and Challenges

Please refer to Canvas for the lecture schedule.

### **Grading:**

Programming Assignments (1 or 2): 10%

Semester-long Project: 10%

Homework (around 5): 20%

Midterm Exam (open book): 20%

Final Exam (open book): 20%

In-class Quiz (any time in class without notification beforehand): 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 commitments 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:**

- Each programming assignment must be done individually. Please do the assignment in a group formed by 3 students in the synchronized way. When you encounter a problem, you can join another student to continue doing the assignment and submit one report with the student as a group, and you need to submit a screenshot showing the problem you encountered. One report can have at most 3 student names. If all the 3 students encounter the same problem, each student needs to screenshot the error message. When you ask us for help, please show us the 3 captured screenshots (required). Please list the student names and student computing IDs in the assignment report.
- Unless otherwise specified, assignments should be submitted through Canvas and are due at 11:59 pm on the due date. Programming solutions should be placed in each student's appropriate Canvas 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 one programming assignment and one homework with the lowest score. Note that they cannot be switched, i.e., you cannot drop two programming assignments or two homeworks.
- The time for each in-class quiz is random. No make-up in-class quizzes will be allowed. We will drop the three lowest in-class quiz scores. The deadline for the in-class quiz is 10 minutes after the quiz starts in the class.
- We drop the lowest scores to cover all possible causes for missing deadlines and in-class quizzes, so we will always use the policy to handle and won't reply to requests for deadline extension and make-up in-class quizzes (no matter what the causes are), and you do not need to notify us your class absence beforehand.
- No make-up for questions for extra credits.

**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](http://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/](http://www.virginia.edu/studenthealth/sdac/).

### **Recording of Class Sessions and Distribution of Course Materials:**

NEW POLICY PROV-005: <https://uvapolicy.virginia.edu/policy/PROV-005>

AMENDED POLICY PROV-008: [https://uvapolicy.virginia.edu/policy/PROV-008#Recording\\_of\\_Classroom\\_Lectures](https://uvapolicy.virginia.edu/policy/PROV-008#Recording_of_Classroom_Lectures)

POLICY GUIDANCE: <https://provost.virginia.edu/academic-policies/guidance-implementing-policy-prov-005>

### **Notes:**

- Please always send your questions and comments to Canvas instead of emails.
- We try to respond to students' questions and requests ASAP. If you do not receive our response within 48 working hours, it means we are likely not to respond because our class policy already addresses your questions/requests and please refer to our syllabus for our class policy.