CS5352.751/752, Summer II, 2020
Distributed Computing

Time: 4:00 − 6:05pm MTWR
Classroom: Zoom only

Instructor: Wuxu PENG
Office Hours: On Zoom only. Varies by each week. Will be announced in class and posted online
Or by appointment
Phone: 512-245-3409 (San Marcos) & 512-716-4562 (RRHEC)
Email: wuxu@txstate.edu
Web: https://keystone.cs.txstate.edu/teaching/cs5352/sum-II-20/
WebPage Username/Password: cs5352/20DC (password to change)

Prerequisites:

Completion with a grade C or above of both CS3358 (Data Structures) and CS4328 (Operating Systems).

Textbooks:

1. Required:
   - George Coulouris, Jean Dollimore, and Tim Kindberg, Gordon Blair *Distributed Systems – Concepts and Desgin*, (5th ed.). Addison-Wesley, 2012. ISBN-10: 0-13-214301-1.
2. Optional (strictly optional, for Java RMI only):
   - Deitel, Deitel & Santry, *Advanced Java 2 Platform: How to Program*. Prentice-Hall, 2002, ISBN 0-13-089560-1.

Course Description:

This will be a very exciting course. Hardware advances during the last decade have made distributed computing a natural extension and alternative to the conventional centralized systems. Many computer scientists believe that the 1990s and beyond will be the decade of distributed computing. Distributed computing have several crucial advantages over their centralized counterparts. Among them most notably are fault tolerance, parallelism, and resource and load sharing. However, the emerging of computing systems has also posed many difficult challenges to computer scientists. In this course we will study the most important and fundamental problems in distributed computing.

A class forum is maintained for the class. The class forum is the primary venue of information exchanges. **Registration of class forum is required, not optional**. The URL for the class forum is: https://keystone.cs.txstate.edu/teaching/class_bbs/

The class forum front page is protected with the same username/password of the class webpage.

Your class forum account username will be posted on class web page shortly after the semester begins. If you have taken my classes last two years, and already have an account for my class forum, and the posted account name is the same as your previous account name, then you can continue to use that account. If your forget your password, you can reset it by clicking a link on class forum front page.

If you haven't taken my class previously, **you are required to register an account with the posted account name**. When you register on class forum, please use a valid email account which will be used to receive a registration confirmation email message. **You must activate your account by following the instructions in that email message**.

Grading Policy:

All assignments are to be submitted electronically through the *homework/project management panel* of class forum web site. For programming assignment, a copy of your program is required to be uploaded on time. A single Word/PDF/PS/ASCII file is not sufficient for programming problems. Please do not submit Windows RAR formated files/bundles. Details of homework/project submissions are posted on the class forum.

As always in every class I teach, I will try my best to maintain fairness in grading. You are encouraged to bring any discrepancy in grading to me and I will try to resolve it promptly and fairly.

Course Evaluation:

There are three to four written homework assignments, plus the final exam. Your final grade for the course will be calculated as follows:

3-4 homework assignments:	60%
Final exam:	40%

Date/Time of Final Exam (tentative):
8:00 − 10:30pm, Thursday, August 6, 2020

Attendance and Incomplete Policies:

As a graduate level course, there is no roll call at the beginning of each meeting session. However, it is your responsibility to attend the class and follow the course progress. Regularly missing class meetings may adversely affect your final grade.

The CS Department has a strict policy and procedure for granting incomplete grades. The instructor has to provide convincing information in writing to the department Chair to get approval. Therefore incomplete will not granted unless convincing reasons are provided. Reasons such as too much workload are not acceptable for requesting an incomplete grade.

Dropping Classes and Withdrawing (Extracted from http://mycatalog.txstate.edu/graduate/registration-course-credit/)

Dropping a class is an official action whereby a student drops one or more courses, yet remains enrolled in at least one other course. Refer to the Registration Instructions at http://www.registrar.txstate.edu for details on dropping a class.

1. The drop deadline is the first 60% of the semester. Please refer to the academic calendar on the Registrar's website for the most current dates.
2. A 'W' grade will be assigned automatically when a student drops one or more classes by the automatic 'W' deadline, the first 60% of the semester.

Withdrawing from the University (dropping all classes) is an official action whereby a student informs the University Registrar, who in turn informs the instructor(s) of record, that the student will cease attending all classes in which enrolled.

1. The deadline to receive an automatic 'W' is the first 60% of the semester. Please refer to the academic calendar on the Registrar's website for the most current dates.

2. After the automatic 'W' period, faculty assigns grades to students who officially withdraw from the University. Faculty assign a 'W' grade only to those students who have a passing average at the time the withdrawal action is officially completed. Otherwise, faculty assigns an 'F' grade.

3. Please refer to the academic calendar on the Registrar's website for the withdrawal deadline.

The student must contact the University Registrar in person, by letter, or by fax to withdraw officially from the University. Visit the Registrar's Office website at http://www.registrar.txstate.edu/ or contact the Registrar's Office at 512-245-2367 for the proper procedures. Students living in university residence halls must also contact the Residence Life Office in person, by letter, or by fax.

Academic Calendar for Summer II, 2020:

First class day	July 6, 2020
Last day to add a course	July 7, ends 3:45pm, 7/07/2020)
Official 4th class day	July 9, 2020
Last day to drop a course with refund	July 9, 2020 (ends 11:59pm 7/09/2020)
Last day to drop with "W" assigned	July 24 (ends 11:59pm 07/24/2020)
Last day to withdraw	July 29 (ends 11:59pm 07/29/2020)
Last class day	August 5, 2020
Reading day (classes don't meet)	None
Final exam	August 6, 2020
Commencement	August 7, 2020
Grades available	August 11, 2020

Academic Integrity:

Academic integrity is an integrated part of high education. Please consult appropriate Texas State documents for university's academic integrity requirements and policies.

Main Topics:

1. Introduction: history of computing and distributed computing
   (1) History of computer systems
   (2) Characteristics of distributed systems
   (3) Advantages of distributed systems
   (4) Distributed systems vs. distributed computing
   (5) General issues in distributed computing
   (6) Goals of distributed computing
2. Review: Elements of operating systems and computer networks (Ch. 1, 7)
   (1) Sequential Processes
   (2) Concurrent Processes
   (3) Specification of Concurrency
   (4) Relationships among the Processes
   (5) Deadlocks
   (6) The Critical Section Problem
   (7) Semaphores
3. Concepts and architectures of distributed systems (Ch. 1, 2, 3)
   (1) Computer networks
   (2) Architecture models
   (3) Major challenges
   (4) System architectures

(5) Fundamental models

4. Distributed time and global state (Ch. 14)
   (1) Time
   (2) Clocks, events, and process states
   (3) Synchronizing physical clocks
   (4) Logical time and clocks
   (5) Global states
5. Interprocess communications (Ch. 4, 5, 6)
   (1) Introduction
   (2) TCP/IP API and Java UDP/TCP API
   (3) External data representation and marshalling
   (4) Client-server communication
   (5) Remote procedure call
   (6) Distributed objects and RMI (remote method invocation)
   (7) Group communications
6. Case Studies of High-Level IPC Facilities
   (1) SUN RPC
   (2) Java RMI
   (3) DCE RPC
7. Distributed coordination and agreement (Ch. 15)
   (1) Nature of the problem
   (2) Centralized synchronization algorithms
   (3) Distributed synchronization based on timestamps
   (4) Distributed synchronization based on token passing
   (5) Election algorithms
   (6) Distributed consensus problem (Byzantine generals problem)
      a. Problem definition and its implications
      b. The first solution
8. Security (Ch. 11) [1]
   (1) Factors affecting security in DSs
   (2) Encryption and security techniques
   (3) Cryptographic algorithms
   (4) Digital signatures
   (5) Cryptography pragmatics

Recording and dissemination of class contents:

No recording or diseminating of any class presentation contents is allowed. Class lecture notes, homework assignments, and exams are all not allowed to be distributed outside of the class, in any form.

[1] Depending upon the progress, this portion may not be covered