Course description

CS 142. Distributed Computing. 9 units (3-0-6); first term. Prerequisites: CS 24, CS 38. Fundamental concepts for the design and analysis of distributed systems and algorithms, including reasoning about distributed programs, handling the lack of global time and global state, achieving distributed consensus in the presence of faults and asynchrony, and designing fault-tolerance for distributed systems. Review of state-of-the-art distributed systems, particularly cloud computing systems. Instructor: Murray/Chandy.

Course announcements

- 11 Oct 2017, 4 pm: updated copies of lecture slides with some small corrections are posted (including Mani's alternative version of the proof for FindMax).
- 4 Oct 2017: If you are having trouble submitting your set via Moodle, try this link: https://courses.caltech.edu/course/view.php?id=2761
- 25 Sep 2017: Lecture materials and HW #1 have been posted.
- 25 Sep 2017: Welcome to CS 142! This page contains all information about the course.

Recent space activity

- CS 142 - Distributed Computing
  Oct 23, 2017 • updated by Richard Murray • view change
- CS 142 - Distributed Computing
  Oct 18, 2017 • updated by Navid Azizan Ruhi • view change
- CS 142 - Distributed Computing
  Oct 13, 2017 • updated by Yoke Peng Leong • view change
- CS 142 - Distributed Computing
  Oct 06, 2017 • updated by Sumanth Dathathri • view change
- CS 142 - Distributed Computing
  Sep 28, 2017 • updated by Linqi (Daniel) Guo • view change

Course syllabus and schedule

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<th>Week</th>
<th>Topic</th>
<th>Reading/homework</th>
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<td>W1 (25 Sep)</td>
<td>Logic and computation</td>
<td>• Sivilotti, Chapters 1 and 2</td>
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<td>• Motivation, course admin</td>
<td>• HW #1 due on 4 Oct</td>
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<td>• Propositional logic, guarded command programs</td>
<td>• Mon lecture slides</td>
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<td>W2 (2 Oct)</td>
<td>Specifications and proofs</td>
<td>• Sivilotti, Chapters 3 and 4</td>
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<td>• Program properties (invariants, safety, liveness)</td>
<td>• HW #2 due on 11 Oct</td>
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<td>• Simple examples and proofs of correctness</td>
<td>• Mon lecture slides</td>
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<td>W3 (9 Oct)</td>
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<td>• HW #3 due on 18 Oct</td>
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<td>Week</td>
<td>Topics and Due Dates</td>
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| W4 (16 Oct) | Time, clocks  
Gossip algorithms  
HW #4 due on 25 Oct  
Mon lecture slides |
| W5 (23 Oct) | Introduction to snapshots (not covered on midterm)  
HW #6 due on 15 Nov |
| W6 (30 Oct) | Snapshots and related topics  
HW #5 due on 8 Nov |
| W7 (6 Nov) | Topic TBD  
HW #7 due on 22 Nov |
| W8 (13 Nov) | Byzantine agreement and blockchains  
HW #8 due on 1 Dec (Fri)  
Final: out 1 Dec, due 8 Dec |

### Grading

The final grade will be based on homework sets, a midterm exam, and a final exam:

- **Homework (50%)**: Homework sets will be handed out weekly and due on Wednesdays by 2 pm (submitted via Moodle). Each student is allowed up to two extensions of no more than 2 days each over the course of the term. Homework turned in after Friday at 2 pm or after the extensions are exhausted will not be accepted without a note from the health center or the Dean.
- **Midterm exam (20%)**: A midterm exam will be handed out at the beginning of midterms period (25 Oct) and due at the end of the midterm examination period (1 Nov). The midterm exam will be open book (textbook and course notes OK: access to the Internet is not allowed).
- **Final exam (30%)**: The final exam will be handed out on the last day of class (1 Dec) and due at the end of finals week. The final exam will be open book (textbook and course notes OK: access to the Internet is not allowed).

### Collaboration Policy

Collaboration on homework assignments is encouraged. You may consult outside reference materials, other students, the TA, or the instructor, but you cannot consult homework solutions from prior years and you must cite any use of material from outside references. All solutions that are handed in should be written up individually and should reflect your own understanding of the subject matter at the time of writing.

No collaboration is allowed on the midterm or final exams.

### Course Text and References

The primary course text is

- **P. Sivilotti, Introduction to Distributed Systems, Course notes, 2007.**

The following additional references may also be useful:

- **K.M. Chandy and J. Misra, Parallel Program Design: A Foundation, Addison-Wesley, 1988**