CS 142 - Distributed Computing

Instructors
- Richard Murray (CMS)
- Mani Chandy (CMS)
- Lectures: MW, 2-3 pm, 105 Annenberg
- Office hours: by appointment

Teaching assistants
- Navid Azizan-Ruhi
- Sumanth Dathathri
- Linqi (Daniel) Guo
- Yoke Peng Leong
- Problem solving sessions: Fri, 2-3 pm, 105 Annenberg
- Office hours: Fri, 4-5 pm, 107 ANB; Tue, 1:30-3:30 pm, 243 ANB
- Online resources: Piazza (Q&A forum), Moodle (HW submission)

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

- 6 Nov 2017, 5:30 pm: updated copies of lecture 7.1 slides with some small corrections are posted.
- 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

Recent space activity

- CS 142 - Distributed Computing
  Nov 20, 2017 • updated by Richard Murray • view change
- CS 142 - Distributed Computing
  Nov 16, 2017 • updated by Navid Azizan Ruhi • view change
- CS 142 - Distributed Computing
  Nov 08, 2017 • updated by Yoke Peng Leong • view change
- CS 142 - Distributed Computing
  Nov 01, 2017 • updated by Linqi (Daniel) Guo • view change
- CS 142 - Distributed Computing
  Oct 06, 2017 • updated by Sumanth Dathathri • view change

Course syllabus and schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading/homework</th>
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| W1 (25 Sep) | Logic and computation | • Sivilotti, Chapters 1 and 2  
• HW #1 due on 4 Oct  
• Mon lecture slides  
• Wed lecture slides  
• Fri lecture slides |
| W2 (2 Oct) | Specifications and proofs | • Sivilotti, Chapters 3 and 4  
• HW #2 due on 11 Oct  
• Mon lecture slides  
• Wed lecture slides  
• Fri lecture slides |
| W3 (9 Oct) | | • HW #3 due on 18 Oct  
• Mon lecture slides  
• Wed lecture slides  
• Fri lectures slides |
<table>
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<tr>
<th>Week</th>
<th>Topics</th>
<th>Reading</th>
<th>Assignments</th>
<th>Notes</th>
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<tr>
<td>W4 (16 Oct)</td>
<td>Time, clocks, Gossip algorithms</td>
<td>Sivilotti, Chapter 5 and 6, HW #4 due on 25 Oct, Mon lecture slides, Wed lecture slides</td>
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<td>W5 (23 Oct)</td>
<td>Introduction to snapshots (not covered on midterm), Note: No lecture on Friday</td>
<td>Sivilotti, Chapter 9, Midterm: out 25 Oct, due 31 Oct, Mon lecture slides, Wed lecture slides</td>
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<td>Midterm office hours: Friday, 3-5 pm, 107 ANB, Monday, 3-5 pm, 213 ANB</td>
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<td>W6 (30 Oct)</td>
<td>Mutual exclusion</td>
<td>Sivilotti, Chapter 7, HW #5 due on 8 Nov, Mon lecture slides, Wed lecture slides</td>
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<td>W7 (6 Nov)</td>
<td>Specifications, refinement, dining philosophers</td>
<td>Sivilotti, Chapter 8, Chandy and Misra, Ch 7 &amp; 12, HW #6 due on 15 Nov, Mon lecture slides, Wed lecture slides</td>
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<td>W8 (13 Nov)</td>
<td>Byzantine agreement and the PAXOS algorithm</td>
<td>Sivilotti, Ch 12, Paxos Made Simple (Lamport, 2001), HW #7 due on 22 Nov, Mon lecture slides, Wed lecture slides</td>
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<td>W9 (20 Nov)</td>
<td>Distributed consensus and distributed ledger</td>
<td>Reading TBD, HW #8 due on 1 Dec (Fri), Mon (20 Nov) lecture slides, Mon (27 Nov) lecture slides, Final: out 1 Dec, due 8 Dec</td>
<td></td>
<td>No class on 22 Nov (Wed), Thanksgiving office hours: 29 Nov (Wed), 4-5 pm (tentative), 30 Nov (Thu), 1:30-3:30 pm (tentative), Finals week office hours: 4 Dec (Mon), 3-5 pm, 5 Dec (Tue), 3-5 pm</td>
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<tr>
<td>W10 (27 Nov)</td>
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**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 two 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


The following additional references may also be useful: