Intro to COS 226

- motivation
- course structure
- assessments
- resources
COS 226 course overview

What is COS 226?

- Intermediate-level survey course.
- Programming and problem solving, with applications.
- **Algorithm**: sequence of instructions for solving a problem.
- **Data structure**: method to organize data in a computer.

<table>
<thead>
<tr>
<th>topic</th>
<th>data structures and algorithms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>data types</strong></td>
<td>stack, queue, union–find, priority queue</td>
</tr>
<tr>
<td><strong>sorting</strong></td>
<td>quicksort, mergesort, heapsort, radix sorts</td>
</tr>
<tr>
<td><strong>searching</strong></td>
<td>BST, red–black BST, hash table, kd-tree</td>
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<tr>
<td><strong>graphs</strong></td>
<td>BFS, DFS, Prim, Kruskal, Dijkstra, maxflow</td>
</tr>
<tr>
<td><strong>strings</strong></td>
<td>tries, KMP, regexp, suffix arrays, data compression</td>
</tr>
</tbody>
</table>
Why study algorithms and data structures?

Their impact is broad and far-reaching.
Why study algorithms and data structures?

They may unlock the secrets of life and of the universe.

http://www.youtube.com/watch?v=ua7YIN4eL_w
Why study algorithms and data structures?

Old roots, new opportunities.

- Study of algorithms dates at least to Euclid.
- Named after Muḥammad ibn Mūsā al-Khwārizmī.
- Formalized by Church and Turing in 1930s.
- Some important algorithms were discovered by undergrads in a course like this!
Why study algorithms and data structures?

To become a proficient programmer.

“I will, in fact, claim that the difference between a bad programmer and a good one is whether he considers his code or his data structures more important. Bad programmers worry about the code. Good programmers worry about data structures and their relationships.”

— Linus Torvalds (architect of Linux and git)
Why study algorithms and data structures?

For intellectual stimulation.

“For me, great algorithms are the poetry of computation. Just like verse, they can be terse, allusive, dense, and even mysterious. But once unlocked, they cast a brilliant new light on some aspect of computing.” — Francis Sullivan
Why study algorithms and data structures?

For fun and profit.
Why study algorithms and data structures?

- Their impact is broad and far-reaching.
- They may unlock the secrets of life and of the universe.
- Old roots, new opportunities.
- To become a proficient programmer.
- For intellectual stimulation.
- For fun and profit.

Why study anything else?
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Lectures

**Live lectures.** Introduce new material.

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>Where</th>
<th>Who</th>
<th>Office Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>L01</td>
<td>TTh 11–12:20</td>
<td>Friend 101</td>
<td>Kevin Wayne</td>
<td>TBA</td>
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</tbody>
</table>

**Electronic devices.** Permitted *only* to support lecture (e.g., viewing slides and taking notes).
Student response system (required).

- Register hardware iClicker in Blackboard.
- Register iClicker Reef using Princeton email address.
- Available at Labyrinth Books ($30).

use only one device per lecture!

Which iClicker are you using?

A. iClicker.
B. iClicker+.
C. iClicker 2.
D. iClicker Reef.
Precepts

Discussion, problem-solving, assignment prep, ...
## Precepts

Discussion, problem-solving, assignment prep, ....

<table>
<thead>
<tr>
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<th>When</th>
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<th>Office Hours</th>
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<tbody>
<tr>
<td>P01</td>
<td>Th 1:30–2:50pm</td>
<td>1976 Hall 028</td>
<td>TBA</td>
<td>see web</td>
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<tr>
<td>P02</td>
<td>Th 3–4:20pm</td>
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<td>P03</td>
<td>F 11–12:20pm</td>
<td>Friend 009</td>
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<td>Friend 009</td>
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<td>F 1:30–2:50pm</td>
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<td>TBA</td>
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<tr>
<td>P05</td>
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<tr>
<td>P07</td>
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- union–find

https://algs4.cs.princeton.edu
Programming assignments

Implement an efficient algorithm or data structure.

Solve an interesting application using a “textbook” algorithm.
Programming environment

**Recommended IDE.** Custom IntelliJ environment (used in COS 126).

- Continuous code inspection; integrated Checkstyle and Spotbugs.
- Autoformat, autoimport, and autocomplete.
- Embedded bash terminal.
- ...
Quizzes

Quizzera platform.

- 2–3 short questions per lecture.
- Solving using pencil and paper.
- 3 attempts per question (score = max).
Written exams.

- Questions drawn from quizzes and lectures.
- Emphasizes non-programming material.

This exam has 10 questions (including question 0) worth a total of 55 points. You have 80 minutes. This exam is preprocessed by a computer, so please write darkly and write your answers inside the designated spaces.

**Policies.** The exam is closed book, except that you are allowed to use a one page cheatsheet (8.5-by-11 paper, one side, in your own handwriting). No electronic devices are permitted.
Grading

Programming assignments. 45%
- Due at 11pm on Mondays via TigerFile.
- Collaboration/lateness policies: see web.

Quizzes. 10%
- Due at 11pm on Fridays via Quizzera.
- Collaboration/lateness policies: see web.

Exams. 15% + 25%
- Midterm (in class on Tuesday, March 24).
- Final (to be scheduled by Registrar).

Active participation. 5%
- Participate in precept/lecture.
  [ perfect attendance not required to earn 100% of participation points ]
- Answer questions in online discussion forum.
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https://algs4.cs.princeton.edu
Resources (textbook)


Available from various vendors and formats.
- Amazon: $70 hardcover, $58 Kindle, ...
- Labyrinth: $63 hardcover, $40 rent.
- Engineering library: on reserve.
- Safari Tech Books Online.
Resources (videos)

Lecture videos (optional).

- Missed lecture.
- Review for exams.
Resources (videos)

Lecture videos (optional).

- Missed lecture.
- Review for exams.

https://cuvids.io
Resources (web)

Course content.

- Course info.
- Lecture slides.
- Programming assignments.
- Quizzes.
- Exam archive.

https://www.cs.princeton.edu/~cos226

Booksite.

- Brief summary of content.
- Download code from book.
- APIs and Javadoc.

https://algs4.cs.princeton.edu
Resources (people)

Online discussion forum.
  • Low latency, low bandwidth.
  • See Ed for guidelines.
  • Use Ed; do not email course staff.

Office hours.
  • High bandwidth, high latency.
  • See web for schedule.

Computing laboratory.
  • Undergrad lab TAs.
  • For help with debugging.
  • See web for schedule.
A typical week (including this one!)

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
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<th>Wed</th>
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<tr>
<td>Lecture 1 (Union–Find)</td>
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<td>Lecture 2 (Analysis)</td>
<td>Precept 1</td>
<td>Quiz 1 and 2</td>
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<td>11</td>
<td>12</td>
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<td>14</td>
<td>15</td>
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<tr>
<td>Assignment 1 (Percolation)</td>
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</tbody>
</table>

you are here!
support lecture material; assignment prep
content based on week’s material
content based on corresponding lectures
Q&A

Not registered? Register ASAP; attend any precept this week.
Change precept? Use TigerHub.

Haven’t taken COS 126? See COS placement officer.
Placed out of COS 126? Review Sections 1.1–1.2 of Algorithms 4/e.