CSCI 406: Algorithms Syllabus

Spring 2025

January 6, 2025

Administrative Information

Instructors	Estelle Smith and Alexandra Chakarov
Estelle Office Hours:	MW @ 2:00-3:00pm (Brown 280-G)
Alex Office Hours:	M @ 9-10:30, WF 3-4pm (CTLM 246B) or by appointment
Email	estellesmith@mines.edu alexandra.chakarov@mines.edu
TAs	Kelly Dance (kdance), Audrey Haas (ahaas1), Sander Schott (sschott), Jayden Pahukula (jaydenpahukula), Stone Amsbaugh (samsbaugh), Matthew Desaulniers (mdesaulniers) Grant Dibala (gdibala), Nathan George (nathan_george) Nathan Webster (nwebster), Isaac Williams (idwilliams)

Administrative Information (continued)

TA office hours	See Syllabus & Canvas
Course Web Page	Canvas Page for Algorithms
Textbook	Algorithm Design Manual, Skiena (Access via Course Readings on Canvas)

Prerequisites

- The Spring 2025 version of CSCI 406 is designed for students who have either taken the 261-262 or 200-220 sequences.
- CSCI 358 must also be completed prior to taking CSCI 406.

Syllabus Quiz

- Located on Canvas
- Due TONIGHT (1/6/25) at midnight
- Counts toward your attendance points
- Requires a score of 100% because you need to understand 100% of course policies
- Infinite attempts allowed
- **Recommended:** Take out your laptop or smart device now and complete this as we go!

About the Course

- Mathematically oriented with emphasis on problem solving.
- 406 content is often the basis for interview questions at elite software companies - assesses your ability to think and reason.
- A former student described it as “making computer scientists out of programmers.”

Expectations and Philosophy

- CS has evolved into a broad discipline.
- Accordingly, Broadened the class from a classical "homework + exams" to include projects and grading interviews.
- Class is moderately rigorous, some find it quite challenging.
- As Mines faculty, we're supposed to set high standards!

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- Class is moderately rigorous, some find it quite challenging.
- As Mines faculty, we're supposed to set high standards!
- However, we are here to help you succeed.
- Accordingly, please ensure that you seek help when you need it.
- Make use of class-time, office hours and Ed Discussion!

Commitments & Time Management

- We understand that Algorithms is not your only activity this semester.
- Your responsibility to ensure that you maintain a reasonable portfolio of activities (not too many, not too few!).
- Practise good time management! Specifically, please start thinking about and working on your homeworks and projects soon after they become available.

Using Office Hours v.s. Ed Discussion

- Use Ed Discussion to post **simple clarification questions** which should generally have yes/no answers.
- Use Office Hours for **everything else** (complicated conceptual questions, coding issues, etc.)
- Do not come to office hours and expect the TA's to "pair program" the assignment with you.
- Make a good faith attempt at the problem first.
- TA's can help point you in the right direction, but they will **not** just give you answers, so don't make that your survival strategy.

Cell phone/laptop policy

- You are required to have an internet-enabled device to answer **iClicker questions** for attendance points.
- Cell phones, laptops, tablets, etc. are otherwise a source of distraction - please silence and place face down (or shut them) when not in use for iClicker.
- If you absolutely need to send a text or take a call, please leave the classroom for the duration of the activity.

Delivery

- In-person with traditional lectures on Mondays, Wednesdays, and Fridays.
- We may provide optional video recordings and content in Canvas for purposes of pre-learning before class or review after class.
- There may be more opportunity for interaction on many Fridays, when we may provide additional opportunities for problem solving, coding demos, or homework/project hints.

Attendance Policy

- In-class attendance is required Monday, Wednesday, and Friday.
- Paper worksheets handed out at start of class (bring a writing utensil!)
- Worksheets **not** turned in; retain them for review
- iClicker questions (about worksheets) used to record attendance
- Attendance scores based on completion, *not* accuracy
- May attend either section A or B to answer iClicker questions
- Must attend a minimum of 70% of class periods to pass the class
- Five (5) "grace days," no questions asked. Do *not* email profs about grace days; applied automatically at end of semester.

Canvas Organization

- On Canvas, under Modules, you will find the class organized by Weeks.
- Each week ends on Saturday at midnight.
- Deliverables will almost always be due at this time. (AlgoBowl is an exception.)

Gradescope and Ed Discussion

- Gradescope for PDF submissions.
- Submissions must be typeset preferably using latex/overleaf.
- Ed Discussion (ED) for online discussions and announcements.
- Check your Mines emails regularly for ED announcement notifications.

Video Recordings

- Youtube videos from Prof. Dinesh Mehta recorded during the pandemic will be made available.
- Professor Alex Chakarov will also record lectures and post them to Canvas following class.
- Neither of these resources are a substitute for in-class attendance, but they may be useful in the event you are absent in class or for review.

Semester at a Glance

Week #	Content	Major Deliverables
Week 1 (ends Jan 11)	Unweighted Graphs	Syllabus quiz, DFS/BFS Review Problem
Week 2 (ends Jan 18)	Shortest Paths	HW1
Week 3 (ends Jan 25)	Advanced Heaps	HW2
Week 4 (ends Feb 1)	MSTs & Disjoint Sets	Maze Project
Week 5 (ends Feb 8)	Network Flows	HW3 (2/05/25); **Exam 1 (Fri, 2/7/25)**
Week 6 (ends Feb 15)	Bipartite Matching	HW4; Maze Grading Interviews
Week 7 (ends Feb 22	Parallel Algorithms	HW5; Maze Grading Interviews
Week 8 (ends March 1)	Review	AlgoBOWL Week
Week 9 (ends March 8)	Dynamic Programming	**Exam 2 (Mon, 3/3/25)**
Week 10 (ends March 15)	Dynamic Programming	HW6
Spring Break	**March 15-23**	No class or assignments :)
Week 11 (ends March 29)	Dynamic Programming	HW7 Part 1; DP Project Part 1
Week 12 (ends April 5)	NPC - Reductions	HW7 Part 2; DP Project Part 2
Week 13 (ends April 12)	NPC - Definitions	
Week 14 (ends April 19)	NPC - More Reductions	HW8
Week 15 (ends April 26)	Coping with NPC	HW9
Week 16 (ends April 30)	Review	
Finals Week (May 2-7)	**Time & Room TBD**	**Cumulative, emphasis on weeks 9-16**

Grading Rubric at a Glance

Projects	30%
Midterm Exams	20% (10% each)
Weekly Homeworks	20%
Attendance	10%
Final Exam	20%

Projects

There will be three projects, each worth 10%.

- Maze Project (individual)
- AlgoBOWL project (group)
- Dynamic Programming Project (individual)

For Maze and DP: Late policy TBD.
AlgoBOWL consists of multiple mini-deadlines. Your group **must** meet these without exceptions.

Homework Assignments

- Of 9 HW submissions, we will discard the HW with lowest score.
- **Late HWs will not be accepted.** It is your responsibility to leave margin for any Gradescope submission issues.
- You may collaborate on HWs with your classmates (anyone taking the class this semester).
- List the names of collaborators.
- Do **not** consult the internet for solutions.
- AA's **"General Prohibition"** policy for Generative AI: Do not use ChatGPT for your algorithms coursework!

Submission Logistics

Typeset PDFs of HWs must be uploaded on Gradescope. These will **not** be accepted by email.

Writing Quality

More words does not equate to better quality. Your writing should be **concise** and **complete**.

- **Do not pad with fluff.**
- Some questions may have stated word limits to support this, with point deductions possible for exceeding limits.
- In cases of extreme verbosity, TA's may deduct points at their discretion, even without a stated word limit.

Plagiarism

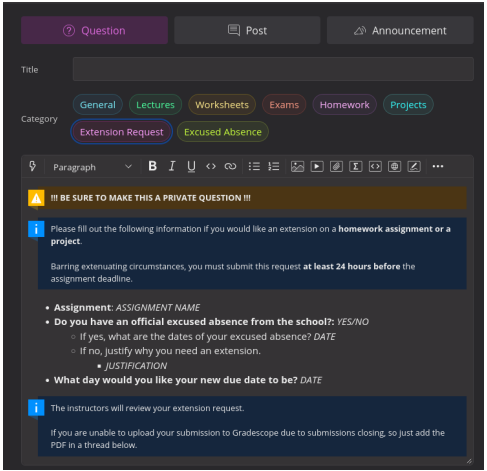
Just say no. (Writing *and* code.)

- We can and do catch students at this.
- We may not alert you right away when we catch students, but it gets ugly when we do.
- It's not worth it. We promise.

Extensions and Excused Absences

- Extensions on deadlines given only if there are extenuating circumstances **AND**
- Requests for extensions must be made during business hours **before** the deadline (unless physically unable, with documentation)
- Most assignments due Saturday, so most requests must be made no later than 5pm on Fridays
- Therefore, be proactive and professional in requesting extensions!
- **Requests for extensions and excused absences must be made on Ed Discussion.**
- Do *not* email the professors; you will be directed to Ed Discussion.

Ask a **PRIVATE** Ed Discussion "Question"



Regrades

Regrade requests **must** be received within 7 days after grades are available.

- Regrade requests must be well-reasoned and specific (see syllabus)
- Else may be rejected as "malformed."
- Grades will generally not be lowered as a result of a regrade request.
- ... unless we receive multiple malformed requests from the same person (in which case they will receive a warning first).

Final Grades

The scores listed in the table below will guarantee the corresponding grades.

93.00	90.00	87.00	83.00	80.00	77.00	73.00	70.00	67.00	63.00	60.00
A	A−	B+	B	B−	C+	C	C−	D+	D	D−

To pass the class, you must have:

1. a passing total score **AND**
2. a passing score in the project component of the class **AND**
3. a passing score in two out of the three total exams.

Additional Syllabus Material on Canvas

- Learning Outcomes.
- CS department collaboration policy.
- Other Mines Policies.

What's the hardest part of this class?

We asked the TA's, and here's what they had to say:

- **The Issue:** This is *also* a writing course (HWs, project reports).
- Can be challenging for techy CS students with limited writing practice or prep from prior classes (e.g., discrete math).
- **The Solution:** Take the writing seriously!
- For HW's, we don't want your "first draft." We want your second or third draft. You've eliminated "the fluff" and reported "the substance."
- For project reports, we require "final draft" quality work.
- It's OK to seek help at office hours to articulate yourself clearly!

What's the hardest part of this class?

We asked the TA's, and here's what they had to say:

- **The Issue:** AlgoBowl is a tricky team project.
- It's *a lot* of work.
- Differing levels of proficiency of teammates.
- **The Solution:** Good Teamwork!
- Communicate responsibilities and mini internal deadlines clearly.
- Plan regular times for co-work.
- More experienced teammates should take the opportunity to teach and mentor less experienced rather than doing it all themself.

What's the hardest part of this class?

- **The Issue:** This may be one of the hardest classes you've yet taken.
- Learning is challenging!
- **The Solution:** Make study friends and hold each other accountable.
- This is a community of learners.
- You are not alone, so please do not struggle alone.

Get to Know You's

Think * Pair * Share

- **Think:**
  - What is one fun thing you did over Winter Break?
  - Who are three people you want on your team for the Zombie Apocalypse?
  - What is one way that an algorithm has affected your life recently? (Think of a specific example.)
- **Pair:** Turn to your neighbor, introduce yourself, and share your example. Maybe this person can become a study friend. :)
- **Share:** Let's hear a few examples from the class!

Get to Know You's