Course Information

Instructors

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Questions?

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Websites

Stellar	Announcements, calendar, grades, and PDF course content. http://stellar.mit.edu/S/course/6/fa20/6.006
Piazza	All discussion related to course material. http://piazza.com/mit/fall2020/6006
Gradescope	LaTeX problem set submissions and regrades. Entry Code: MZXRZY https://www.gradescope.com/courses/148664/
Code Checker	Auto-graded code problem set submissions. All grades, extension and make-up requests. https://alg.mit.edu

Content

6.006 is an introductory course covering elementary data structures (dynamic arrays, heaps, balanced binary search trees, hash tables) and algorithmic approaches to solve classical problems (sorting, graph searching, dynamic programming). Written course material will be distributed via notes from lectures and recitations. An additional useful reference is **Introduction to Algorithms** by Cormen, Leiserson, Rivest, and Stein (Third Edition, MIT Press), commonly known as **CLRS**, though this text is not required for the course.

Prerequisites

6.0001	Basic experience programming in Python 3.
6.042	Basic knowledge of discrete mathematics: set theory, relations and logic, combinatorics, proofs, recursion, number theory, graph theory, and probability.

We **strongly** caution against taking 6.006 before having fulfilled the listed prerequisites. We will evaluate entering understanding of the prerequisite material via a short Problem Set 0 assignment (Released T 9/01 and Due on S 9/05). **All students must submit this evaluation, regardless of prerequisite status**. We will assign each submission a letter grade: A, B, or C. If you receive a C on the assignment, you will need to meet with a staff member to review your performance before you will be allowed to take the class. **We will not grade any other assignments from you until a good faith attempt of Problem Set 0 has been submitted**. The grade for this assignment will NOT affect your final grade in the class, but turning it in is required for taking this class.

Lectures

All times listed for lectures, recitations and office hours are Eastern Standard Time.

One-hour lectures will occur **LIVE in Zoom classrooms** Tuesdays and Thursdays at 11am. Note that you will need to use your MIT Zoom account. Non-MIT Guests will be placed in a waiting room and should clearly identify themselves with their full name if they wish to attend lecture (e.g., `iPhone user` will not be allowed to attend the Zoom lecture).

This document will be updated with a Zoom link for lectures by 8/31. The lectures will be recorded and available for later viewing via links that can be accessed by going to the **Online Content** page on `alg.mit.edu` after login. The Zoom link for lecture will also be available at this page for convenient clicking.

Recitations

One-hour **Recitations** will be held weekly on Wednesdays and Fridays. Recitations supplement the material presented in lecture in a more interactive setting. You are responsible for material presented during both lecture and recitation. Recitations will occur in **LIVE in Zoom classrooms**.

Recitation times will be determined by 8/31 and will be posted on Stellar. You will then be able to sign up for a section of your choice. This document and the `alg.mit.edu` (**Online Content**)

will be updated with the Zoom links for recitations. While recitations are online, they will still be space limited. If you attend a section to which you are not assigned, the TA may ask you to leave if there are too many students connected. Our goal is to have approximately fifteen students per recitation section, and no more than twenty.

Given the virtual nature of the class, we want to engage with students as much as possible to ensure that students stay motivated and there are good learning outcomes for every student. Participation in recitations is not mandatory but attendance and participation, if a student so chooses, can count for 10% of your grade – see grading policy section. The course staff strongly believes that attending and participating in sections is as important as doing the problem sets to learn the material and do well on the exams. We strongly encourage students to use webcams when attending recitation, but understand that resource limitations, including bandwidth issues, may preclude this.

Office Hours

Virtual office hours will use a queuing system hosted at `alg.mit.edu`. Office hours will begin on Monday, September 7th. More details will be provided during the first week of classes.
Instructors will hold individual office hours online by appointment.

Grading Policy

Your grade will be based on recitation, 9 problem sets, 3 quizzes, and a final exam.

	Weight	Date	Time
Quiz 1	20%	Thursday, October 1, 2020	7:30–9:30 P.M.
Quiz 2	15%	Thursday, October 29, 2020	7:30–9:00 P.M.
Quiz 3	10%	Thursday, December 3, 2020	7:30–8:30 P.M.
Final Exam	25%	December 14-18, 2020	3 hour block
Problem Sets	20%	9 Problem Sets, $\approx 2\%$ each	
Recitation	10%	Based on attendance and participation (exams are weighted higher if exam performance is better than recitation grade)	

Recitation grades will be determined based on attendance and participation and **not** on the correctness of answers given during each section. Please expect that the TA will call on each student multiple times during a recitation section verbally or through Zoom chat. The course instructors will assign recitation grades each week based on the Zoom chat transcript and additional input from the recitation TA(s). Please do not simply log on with muted audio and no video and expect that you will receive attendance or participation credit if you do not actually participate in the recitation, and respond to questions posed by the TA. *We expect that any student who makes an honest effort to participate in section will receive full credit for each section attended.*

We understand that some students prefer to spend time learning material on their own. We will therefore allow students to skip recitations and have their exam scores weighed more heavily. We

will also compute each student's overall score (out of 100) by scaling up the exams by $\frac{80}{70}$ and then adding the problem set score (out of 20). (The recitation score will be ignored in this computation.) We will take the higher of the two scores given by the table above, and the scaled up exams plus problem set score.

MIT provides definitions[1] for the letter grades A, B, C, D/NE, and F/NE. We will follow these guidelines in assigning letter grades based on your overall score computed as described above.

If you feel that any assignment has been graded incorrectly, you may submit a **regrade request** to the relevant assignment on Gradescope, within a regrade window after the assignment's grade has been released (typically about a week). For any regrade request, we reserve the right to regrade the **entire assignment**, and your grade may be adjusted **up or down** as a result of the regrade.

Exams

There will be no official lecture on quiz days. A review will be given during the recitation preceding each quiz. Quizzes and the Final Exam will be open book. Since the exam durations are relatively short, we **strongly recommend** that you treat exams as closed book exams and prepare a short set of notes that you can quickly refer to during the exam. **You are not allowed to visit any websites outside of Stellar 6.006 Fall 2020 for reference material and 6.006 Fall 2020 Piazza to ask private clarification questions during the exam.**

Attendance at the quizzes and the Final Exam is mandatory and may not be excused. A quiz may be rescheduled at the emailed request of an Institute Dean. Please submit makeup exam requests via the online form on `alg.mit.edu`. Course-wide makeup quizzes will be given within a day of the scheduled date. Conflict Final Exams will be scheduled by the registrar.

Problem Sets

PS	Release	Due	Topic
0	T 9/01	S 9/05	Prerequisite Evaluation
1	F 9/04	F 9/11	Asymptotics, Sequences
2	F 9/11	F 9/18	Sets, Sorting, Recurrences
3	F 9/18	F 9/25	Hashing, Linear Sorting
4	F 10/02	F 10/09	Binary Trees, Binary Heaps
5	F 10/09	F 10/16	Graph Traversal
6	F 10/16	F 10/23	DAG Relaxation, Bellman-Ford
7	F 10/30	F 11/06	Dijkstra's, Johnson's
8	F 11/06	F 11/13	Dynamic Programming
9	F 11/13	F 11/20	More Dynamic Programming

Each problem set will contain a theory portion and a coding portion. Each theory portion must be entered into Gradescope; you will either type directly into Gradescope or upload a PDF file compiled from a provided LaTeX template. Each coding portion will be administered and automatically graded via our Code Checking website, and must be completed using Python 3. Problem set

[1] `http://catalog.mit.edu/mit/procedures/academic-performance-grades/#gradestex`

submissions are **due by 6 P.M.** on the posted due date.

Late submissions will be accepted up until 48 hours after the due date, also at 6 P.M.. Solutions will be posted shortly after the late submission window closes. We will not penalize your two highest scoring late submissions, but we will penalize any additional late submissions by 50%. In exceptional circumstances, problem set deadlines may be individually extended without penalty at the emailed request of an Institute Dean. Please submit extension requests via the online extension form on `alg.mit.edu`. As every assignment contributes to learning, **not doing an assignment will result in a loss of $\approx$ 2% of the overall grade**.

Collaboration

The goal of the problem sets is for you to practice applying the course material. In this class, you are **encouraged** to collaborate on problem sets. Students who work together on problem sets generally do better on exams than students who work alone, but you will learn the material best if you **work on the problems FIRST on your own**. Some forms of collaboration are **not allowed**; some examples are listed below. Violating the collaboration policy to increase your score on a problem set is likely to lower your score on an exam, which carries significantly more weight. A violation may also lead to academic action and/or a significant penalty on your grade.

- Identify any **collaborators** or **outside sources** at the top of each LaTeX submission.
- Write code and theory problem solutions **by yourself** in your own words.
- Do **NOT** directly copy the work of others.
- Do **NOT** look at written solutions or code by other students before submitting your own solution. You may look at another student's code on their screen, only to help them debug, and only after you have submitted your own solution.
- Do **NOT** let other students see your written solutions.
- Do **NOT** send other students your code.
- You may ask TAs to help you debug your code during office hours or in a private Piazza post.

Syllabus

	Date	Lec	Topic		Date	Rec	Topic
T	9/01	L01	Algorithmic Thinking (SD1)	W	9/02	R01	Asymptotics
R	9/03	L02	Algorithm Analysis and Recurrences (SD2)	F	9/04	R02	Python Lists
T	9/08	L03	Search / Sort (SM1)	W	9/09	R03	Recurrences / Master Theorem
R	9/10	L04	Direct Access & Hashing (SM2)	F	9/11	R04	Python Dicts and Sets
T	9/15	L05	Linear Sorting (JS1)	W	9/16	R05	Sorting Review
R	9/17	L06	Balanced Binary Trees (JS2)	F	9/18	R06	Binary Trees in Python
T	9/22	L07	BSTs and Sequence Trees (SD3)	W	9/23	R07	BSTs in Python
R	9/24	L08	Heaps / Priority Queues (SD4)	F	9/25	R08	Heaps in Python
T	9/29	L09	Breadth-First Search (SM3)	W	9/30	R09	Quiz 1 Review
R	10/01		**Quiz 1: L01 – L08**	F	10/02		
T	10/06	L10	Depth-First Search (SM4)	W	10/07	R10	Graph Traversal in Python
R	10/08	L11	Weighted Shortest Paths (SM5)	F	10/09	R11	Relaxation
T	10/13		Virtual Monday	W	10/14		
R	10/15	L12	Bellman-Ford (SM6)	F	10/16	R12	Bellman-Ford in Python
T	10/20	L13	Dijkstra (JS3)	W	10/21	R13	Dijkstra in Python
R	10/22	L14	All-Pairs Shortest Paths (JS4)	F	10/23	R14	Johnson's Algorithm & Review
T	10/27	L15	Dynamic Programming Intro (SD5)	W	10/28	R15	Quiz 2 Review
R	10/29		**Quiz 2: L01 – L14**	F	10/30		
T	11/03	L16	Guessing Subproblems (SD6)	W	11/04	R16	Dynamic Programming in Python
R	11/05	L17	Subproblem Expansion (JS5)	F	11/06	R17	Dynamic Programming Examples I
T	11/10	L18	Dynamic Programming Shortest Paths (JS6)	W	11/11		Veteran's Day
F	11/12	L19	Subset Sum & Pseudo-polynomial (MK1)	F	11/13	R19	Dynamic Programming Examples
T	11/17	L20	P, NP, Hardness, Completeness (MK2)	W	11/18	R20	Partition & 0-1 Knapsack
R	11/19	L21	Specialized Algorithms (SM7)	F	11/18	R21	Complexity
T	11/24		Thanksgiving	W	11/25		
R	11/26		Thanksgiving	F	11/27		
T	12/01	L22	Algorithms Research (JS7)	W	12/02	R22	Quiz 3 Review
R	12/03		**Quiz 3: L01 – L20**	W	12/04		
T	12/08	L23	Algorithmic Puzzles (SD7)	W	12/09	R23	Final Review
M	12/14-18		**Final: L01 – L23**				